# Task 3.2

## Quarterly Status Report # 6

*for the project entitled*

# Dairy Best Available Technologies in the Okeechobee Basin

(SFWMD Contract No. C-11652)

*Submitted by*


## SWET, Inc.

Soil and Water Engineering Technology, Inc.

*In Association With*

MOCK•ROOS
CH2M HILL
ENTEL


**May 12, 2004**

The SWET Team

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## Introduction

This is the sixth quarterly status report for the Dairy Best Available Technologies (BAT) project. This report covers two quarters from October 1, 2003 through March 30, 2004. The primary activities during these two quarters have been the completion of construction for the three edge-of-farm treatment systems at the dairies, installation of the treatment system monitoring systems, initial evaluation and design phase for Amendment 1, conducting routine monitoring, and analyzing the monitoring data. Table 1 shows the status of each individual task.

## Monitoring Activities and Problems Encountered

Monitoring has continued successfully, but as noted in the previous status reports, flow measurement has been continued to be hampered by the lack of sensitivity of the velocity meters due to clear water conditions. The filtering processing has been working quite well, so it has been decided to continue using this technique for now, but a more in depth evaluation of other possible analysis techniques will be done during the final assessment of the data. Because the District is also using similar monitoring equipment, their staff will be consulted as to other analysis techniques. If a better analysis technique is found, then all of the data will be redone using it.

The primary activity has been the installation of the treatment monitoring sites as presented in the Task 3.8 "Monitoring Plan" dated April 27, 2004. The two treatment sites at Davie Dairy were completed during November 2003, while the three new sites at Dry Lake and the two new sites at Butler Oaks were completed and brought online during March 2004. Samples were collected at the Davie Dairy sites during this reporting period, but not for the other sites due to just coming on line at the end of the period. None of the treatment systems had any treatment taking place during the reporting period.

The monitoring site at KREA 32B was taken out of service on September 9, 2003 due to construction activities and was put back into service on November 21, 2003.

The primary problem encountered during the period was the failure of two of the pressure/velocity transducers. Replacements were not available and had to be ordered, which caused sites KREA 41A and particularly Davie East to have periods of poor or missing data. Five new transducers were obtained and all sites were put back in full service.

# TABLE 1. STATUS REPORT
# FOR
# DAIRY BEST AVAILABLE TECHNOLOGIES PROJECT
# March 30, 2004

| TASK NO PHASE I | TASK / DELIVERABLES DESCRIPTION | SCHEDULED COMPLETION DATE | STATUS |
|---|---|---|---|
| 1 | **Development of Goals, Performance Measures and Potential Impacts** | | |
| | 1.1 Project Kick-Off Meeting | 11/9/2000 | Completed |
| | 1.2 Devlop Draft Goals, Potential Impacts/Performance Measures and Evaluation Method | 12/2/2000 | Completed |
| | 1.3 Conduct and Submit Literature/Data Search and Summary | 1/2/2001 | Completed |
| | 1.4 Submit Final Goals, Potential Impacts/Performance Measure and Evaluation Method | 2/2/2001 | Completed |
| 2 | **Assessment and Selection of Project Sites** | | |
| | 2.1 Ranking and Selection of Dairy Sites | 2/2/2001 | Completed |
| | 2.2 Development of Landowner Agreements | 4/2/2001 | Completed |
| | 2.3 Develop and Submit Draft QAPP and Monitoring Plans | 6/2/2001 | Completed |
| | 2.4 Formulate Technology Alternatives and Submit Draft Report | 6/2/2001 | Completed |
| | 2.5 Finalize and Submit Final QAPP and Monitoring Plans for Existing Dairy Conditions | 8/2/2001 | Completed |
| | 2.6 Finalize Technology Alternatives and Submit Final Report | 8/2/2001 | Completed |
| | 2.7 Complete Evaluation of Alternatives and Submit Draft Report | 9/2/2001 | Completed |
| | 2.8 Develop and Submit Draft CNMPs for the Three Selected Dairies | 10/2/2001 | Completed |
| | 2.9 Prepare for and Conduct One Stakeholders Meeting | 10/2/2001 | Completed |
| | 2.10 Finalize the Evaluation of Alternatives and Submit Final Report | 11/2/2001 | Completed |
| | 2.11 Finalize the CNMPs for the Three Selected Dairies and Submit Final Report | 11/2/2001 | Completed |
| | 2.12 Governing Board Presentation | 11/2/2001 | Completed |
| | STOP/GO DECISION POINT for Phase II | | |
| **PHASE II** | (Requires Governing Board Approval) | | |
| 3 | **Implementation and Monitoring of Alternatives** | | |
| | 3.1 Farm Level P Load Monitoring | | |
| | 3.1.1 Equipment purchase (up to a total of 9 sites) | 11/2/2001 | Completed |
| | 3.1.2 Install and Test Monitoring Stations (9 stations assumed) | 11/2/2001 | Completed |
| | 3.1.3 Conduct Routine Field Monitoring Activities - TP (52 Biweekly trips from RPB) | Starting 11/2/2001 | Started 5/1/02 |
| | 3.1.4 Laboratory Analyses (assume 9 biweekly samples for 52 trips TP @$15/sam.)* | Starting 1/2/2002 | Started 5/1/02 |
| | 3.1.5 Labor & Lab for 9 monthly samples for 24 mo. Fecal and TSS @ $45/sample * | Starting 1/2/2002 | To end 5/15/04 |
| | 3.2 Preparation and Submittal of Quarterly Reports | Starting 11/2/2001 | Seventh/Eigth Reports |
| | 3.2.A Amendment No. 1 | 1/15/2004 | To be scheduled |
| | 3.3 Develop Draft Vendor Project Documents | 1/2/2002 | Completed |
| | 3.3.A Amendment No. 1 | 7/2/2003 | Completed |
| | 3.4 Finalize Vendor Project Documents | 3/2/2002 | Completed |
| | 3.4.A Amendment No. 1 | 8/1/2003 | Completed |
| | 3.5 Draft Implementation Plan for Selected Technologies | 3/2/2002 | Completed |
| | 3.5.A Amendment No. 1 | 3/1/2004 | In Process |
| | 3.6 Draft Monitoring Plan for Selected Technologies | 3/2/2002 | Completed |
| | 3.6.A Amendment No. 1 | 2/1/2004 | To be scheduled |
| | 3.7 Development of the Final Implementation Plan for Selected Technologies | 5/2/2002 | Completed |
| | 3.7.A Amendment No. 1 | 5/1/2004 | To be scheduled |
| | 3.71 Cost of Implementing Vendor Technology | Starting 5/2/2002 | Completed |
| | 3.7.1.A Amendment No. 1 | 5/1/2004 | In Process |
| | 3.72 Review and Inspect Vendor Contruction Activities | Starting 5/2/2002 | Completed |
| | 3.7.2.A Amendment No. 1 | Starting 9/1/2004 | To be scheduled |
| | 3.7.3 Vendor Payments | Starting 5/2/2002 | In Process |
| | 3.8 Final Monitoring Plan for Selected Technologies | Starting 5/2/2002 | Completed |
| | 3.8.A Amendment No. 1 | 3/1/2004 | To be scheduled |
| | 3.8.1 Equipment Purchase (up to a total of 6 sites) | 6/2/2002 | Completed |
| | 3.8.1.A Amendment No. 1 | 3/1/2004 | To be scheduled |
| | 3.8.2 Install and Test Monitoring Stations | 6/2/2002 | 7 sites completed |
| | 3.8.2.A Amendment No. 1 | 5/1/2004 | To be scheduled |
| | 3.8.3 Conduct Routine Monitoring Activities - TP | Starting 8/2/2002 | In Process |
| | 3.8.3.A Amendment No. 1 | 5/1/2004 | To be scheduled |
| | 3.8.4 Laboratory Analyses TP | Starting 8/2/2002 | In Process |
| | 3.8.4.A Amendment No. 1 | 5/1/2004 | To be scheduled |
| | 3.9 Prepare for and Attend Bi-annual Site Meeting (5 qtrs) | Starting 8/2/2002 | 1 Meeting during period |
| | 3.9.A Amendment No. 1 | Starting 8/2/2004 | To be scheduled |
| | 3.10 Prepare for and Conduct Public Workshop | 11/2/2002 | To be scheduled |
| | 3.11 Submit Workshop Minutes | 12/2/2002 | To be scheduled |
| 4 | **Evaluation of Alternatives Perforance** | | |
| | 4.1 Prepare and Submit Draft Final Report | 9/2/2003 | To be scheduled |
| | 4.2 Prepare for and Conduct Public Workshop | 10/2/2003 | To be scheduled |
| | 4.3 Prepare and Submit Final Report and Associated Project Data | 11/2/2003 | To be scheduled |
| | 4.4 Prepare and Submit Workshop Minutes | 11/2/2003 | To be scheduled |

**Analysis of Flow and Water Quality Data**

The flow and water quality data for the monitoring sites has been analyzed (see Appendix A). Table 2 provides a summary of the estimated flow and phosphorus loads from the sites through the end of the reporting period. As previously noted, the estimated flow volumes are subject to error. All sites were functional during this reporting period with the exceptions noted in the previous section.

Flow has been recorded at all sites, but due to very dry conditions flows have been intermittent and very low. The higher flow shown in Table 2 for Davie Dairy was the result of higher flows during the previous reporting period, but was further investigated because it was inconsistent with the other two sites. Field observations of higher flow at Davie dairy were made on several occasions by the dairyman and project staff during site visits. The majority of the larger flow occurred during the summer of 2003. For example, one event in September, 2003 produced about 4 inches of runoff at Davie while the other dairies had very little. It appears that a coastal rainfall pattern might have been reaching the dairy because Davie Dairy is about twelve miles closer to the coast. Rainfall data recorded at the dairy also verified high rainfall during the periods of higher recorded flow.

Monthly all entered water quality data and downloaded velocity and depth data were processed through the EXCEL data management spreadsheet which checks the QC samples and calculates the flow and P loads. The spreadsheet plots all the data for a visual inspection and validation. An important data management function of cleaning the very noisy velocity data is performed in the spreadsheet. The filtering process includes using a stage to velocity relationship developed from data from stable periods of record to fill velocity data gaps when stage is available. During noisy periods a moving average of the maximum velocity values is used because most of the noise is caused by the clean water conditions dropping signal levels to zero or below. As noted earlier this method has worked well, but if a better analysis technique is found then all data will be redone using it.

The phosphorus data (Figure A-27) are consistent with District data measured at the same locations. The phosphorus data are also presented on the flow plots Figures (A-3 to A-26) to show the sample compositing period and how the phosphorus concentrations relate to flow. Fecal coliform levels (Figure A-28) are low for all sites during this reporting period, except for one spike at Davie North during September. The total suspended (TSS) concentrations were low (Figure A-29) during the entire reporting period. .

The equipment blanks (Table 3) analyzed as part of the quality assurance program were all below detectable limits during this reporting period, which indicate excellent field protocol. Results from the duplicate samples were within the acceptable range during the reporting period, see Table 4.

Table 2. Summary of Flow and P Concentration Data for Dairy BAT Monitoring Sites
(All site data is averaged for the period of 3/02 through 4/04)

| **Dairy Name** | **Davie Dairy** | | | | |
|---|---|---|---|---|---|
| Site Name | Davie South | Davie North | Davie East | Tin | Tout |
| Volume (ac-in) | 120967 | 15638 | 45797 | 5499 | 6907 |
| Runoff (in) | 48.38 | 48.26 | 45.79 | 2.20 | 2.76 |
| Runoff (in/yr) | 23.59 | 23.47 | 22.32 | 5.50 | 5.75 |
| Area (ac) | 2500 | 324 | 1000 | 2500 | 2500 |
| P load (lbs) | 38606 | 14265 | 4253 | 1113 | 712 |
| P load (lbs/yr) | 18824 | 6938 | 2073 | 2783 | 1482 |
| Flow Avg P (ppm) | 1.41 | 4.02 | 0.41 | 0.89 | 0.45 |
| Years of Data | 2.05 | 2.06 | 2.05 | 0.40 | 0.48 |
| **Dairy Name** | **Butler Oaks Dairy** | | | | |
| Site Name | KREA 41A | KREA10D | Tin | Tout | |
| Volume (ac-in) | 56748 | 54542 | * | * | |
| Runoff (in) | 26.50 | 36.36 | * | * | |
| Runoff (in/yr) | 13.84 | 17.72 | * | * | |
| Area (ac) | 2141 | 1500 | * | * | |
| P load (lbs) | 30417 | 13605 | * | * | |
| P load (lbs/yr) | 14532 | 6633 | | | |
| Flow Avg P (ppm) | 2.36 | 1.10 | * | * | |
| Years of Data | 2.09 | 2.05 | * | * | |
| **Dairy Name** | **Dry Lake Dairy** | | | | |
| Site Name | KREA 32B | KREA 49A | Tin | Tmid | Tout |
| Volume (ac-in) | 10176 | 8907 | * | * | * |
| Runoff (in) | 26.36 | 29.69 | * | * | * |
| Runoff (in/yr) | 12.52 | 14.95 | * | * | * |
| Area (ac) | 386 | 300 | * | * | * |
| P load (lbs) | 7799 | 9152 | * | * | * |
| P load (lbs/yr) | 3704 | 4610 | | | |
| Flow Avg P (ppm) | 3.38 | 4.53 | * | * | * |
| Years of Data | 2.11 | 1.99 | * | * | * |

* Just installed at end of reporting period

**Table 3. Results of the Equipment Blanks for the Project to Date**

| Site | Date | Time | Duplicate | Total P (mg/l) | Fecal Coliform (mg/l) | TSS (mg/l) |
|---|---|---|---|---|---|---|
| #1 | 7/31/2002 | 8:00 | | BDL | BDL | BDL |
| #2 | 7/31/2002 | 14:45 | | BDL | BDL | BDL |
| #1 | 8/7/2002 | 0:00 | | BDL | | |
| #2 | 8/7/2002 | 0:00 | | BDL | | |
| #1 | 8/21/2002 | 0:00 | | BDL | BDL | BDL |
| #2 | 8/21/2002 | 0:00 | | BDL | BDL | BDL |
| #1 | 8/27/2002 | 0:00 | | BDL | | |
| #2 | 8/27/2002 | 0:00 | | BDL | | |
| #1 | 9/11/2002 | 8:00 | | BDL | BDL | BDL |
| #2 | 9/11/2002 | 15:20 | | BDL | BDL | BDL |
| #1 | 11/21/2002 | 0:00 | | BDL | BDL | BDL |
| #2 | 11/21/2002 | 0:00 | | BDL | BDL | BDL |
| #1 | 12/17/2002 | 0:00 | | BDL | BDL | BDL |
| #2 | 12/17/2002 | 0:00 | | 0.692 | 270 | 4 |
| #1 | 1/2/2003 | 0:00 | | BDL | | |
| #2 | 1/2/2003 | 0:00 | | BDL | | |
| #1 | 1/30/2003 | 0:00 | | BDL | BDL | BDL |
| #1 | 2/26/2003 | 1:00 | | BDL | BDL | BDL |
| #1 | 3/11/2003 | 8:25 | | BDL | | |
| #1 | 3/20/2003 | 8:10 | | BDL | BDL | BDL |
| #1 | 4/21/2003 | 8:15 | | BDL | | |
| #1 | 4/30/2003 | 8:35 | | BDL | BDL | BDL |
| #1 | 5/29/2003 | 13:25 | | BDL | | |
| #1 | 6/30/2003 | 9:30 | | BDL | BDL | BDL |
| #1 | 7/30/2003 | 9:28 | | BDL | BDL | BDL |
| #1 | 8/18/2003 | 7:45 | | BDL | BDL | BDL |
| #1 | 8/26/2003 | 8:00 | | BDL | | |
| #1 | 9/8/2003 | 9:05 | | BDL | | |
| #1 | 9/30/2003 | 8:00 | | BDL | BDL | BDL |
| #1 | 10/22/2003 | 8:30 | | BDL | BDL | BDL |
| #1 | 11/7/2003 | 8:15 | | BDL | | |
| #1 | 11/25/2003 | 0:00 | | BDL | BDL | BDL |
| #1 | 12/17/2003 | 10:00 | | BDL | | |
| #1 | 12/30/2003 | 8:10 | | BDL | BDL | BDL |
| #1 | 1/19/2004 | 10:15 | | BDL | | |
| #1 | 1/29/2004 | 8:45 | | BDL | BDL | BDL |
| #1 | 2/12/2004 | 8:00 | | BDL | | |
| #1 | 2/24/2004 | 8:15 | | BDL | BDL | BDL |
| #1 | 3/12/2004 | 8:30 | | BDL | | |
| #1 | 3/30/2004 | 8:55 | | BDL | | BDL |

**Table 4. The Percentage Difference for Duplicate Samples Collected at the Same Time and Location**

| Davie T-Out | | Davie South | | Davie East | | KREA 10D | | KREA 41 | | KREA 41A | | KREA 49A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | % Diff | Date | % Diff | Date | % Diff | Date | % Diff | Date | % Diff | Date | % Diff | Date | % Diff |
| 2/12/04 | 9.1% | 7/31/02 | -1.6% | 9/30/03 | 0.0% | 7/30/03 | -10.1% | 8/27/02 | -4.5% | 7/11/02 | 1.2% | 7/24/02 | -0.4% |
| | | 8/7/02 | -3.7% | | | 8/18/03 | -4.7% | | | 7/18/02 | -3.1% | 8/21/02 | 132.8% |
| | | 11/21/02 | 1.9% | | | 11/7/03 | -10.9% | | | 9/11/02 | 0.0% | | |
| | | | | | | 11/25/03 | -4.1% | | | 1/30/03 | -9.1% | | |
| | | | | | | 12/17/03 | -2.1% | | | 3/11/03 | 2.1% | | |
| | | | | | | 12/30/03 | 5.5% | | | 4/21/03 | -7.3% | | |
| | | | | | | 1/19/04 | 3.8% | | | 5/29/03 | -111.9% | | |
| | | | | | | 1/29/04 | 15.2% | | | 6/30/03 | 119.3% | | |
| | | | | | | 2/24/04 | 0.0% | | | 8/26/03 | 10.5% | | |
| | | | | | | 3/12/04 | 16.1% | | | 9/8/03 | 21.1% | | |
| | | | | | | 3/30/04 | -7.2% | | | 10/22/03 | -4.0% | | |

**Vendor and Construction Progress**

The three current dairy projects completed the construction phase during the reporting period. A summary of the construction activities will be provided for each dairy.

Construction was completed at Butler Oaks, Davie, and Dry Lake dairies during March, October, and March, respectively. All systems have been tested and deemed functional as of March 31, 2004. Numerous minor issues were encountered and fixed during the final construction inspections including eroded areas needing sodding, pump control units not functioning properly, riser boards not sealing properly, riser board elevation adjustments, flow meters not properly functioning, and fencing needing to be moved to better protect dikes. A couple remaining items (hour meters and diversion value for pump outlet to waste storage pond) still need to be completed at Butler Oaks as of the end of this reporting period and therefore its construction final completion status had not been approved.

As of March 31, 2004 none of the systems had chemicals in their tanks. FDACS was contacted and was in the final stages of setting up their O&M contract agreements with each vendor. The chemical supplier was contacted and pricing was obtained by each dairymen. Once the FDACS contracts are finalized, chemicals are to be delivered to each farm.

Work was started on Amendment 1 (Milking R, Inc.) project during September, 2003 by Royal Consulting Services, Inc. (RCS). RCS has completed their environmental and topographical survey and submitted a preliminary Implementation Plan for the project during March, 2004. They also developed a draft of the ACOE Nationwide Permit application for construction in wetlands. The coordination of our Dairy BAT project and the existing P Control Grant project on the dairy was a priority during the development of the preliminary implementation plan. Other program and funding issues between the programs is still being worked out at the end of the reporting period.

A summary of the costs by the vendors to date is provided in Table 5. MWBE forms have been submitted as required. The majority of the costs during this period have been for actual construction and the preliminary design work on the Milking R project. Table 6 provides an adjusted project schedule.

**Table 5. Invoiced Expenditures for Vendors through April 15, 2003**

| Vendor Name | Percentage | Invoiced through April 15, 2004 |
|---|---|---|
| Engineering & Water Resources, Inc. | 100% | $574,996.28 |
| CDM | 100% | $575,000.00 |
| Environmental Research & Design | 100% | $574,041.26 |
| **AMENDMENT 1** | | |
| Royal Consulting Services, Inc | 12% | $67,733.65 |
| | **Total** | **$1,791,771.19** |

**Table 6. EOF Activities Schedule**

| Tasks | Schedule 2004 | | | | | | |
|---|---|---|---|---|---|---|---|
| | April | May | June | July | August | Sept | Oct |
| **First Three Dairies** | | | | | | | |
| Completion of construction | Done | | | | | | |
| System Startup and Testing | | | | | | | |
| Monitoring Original 9 Sites | | Ends | | | | | |
| Monitoring Treatment Sites | | | | | | | |
| **Amendment 1 Dairy** | | | | | | | |
| Implementation Plan | | | | | | | |
| Start Construction | | | | | | | |
| Permits | | | | | | | |
| Monitoring plan and Installation | | | | | | | |

## Permitting Issues

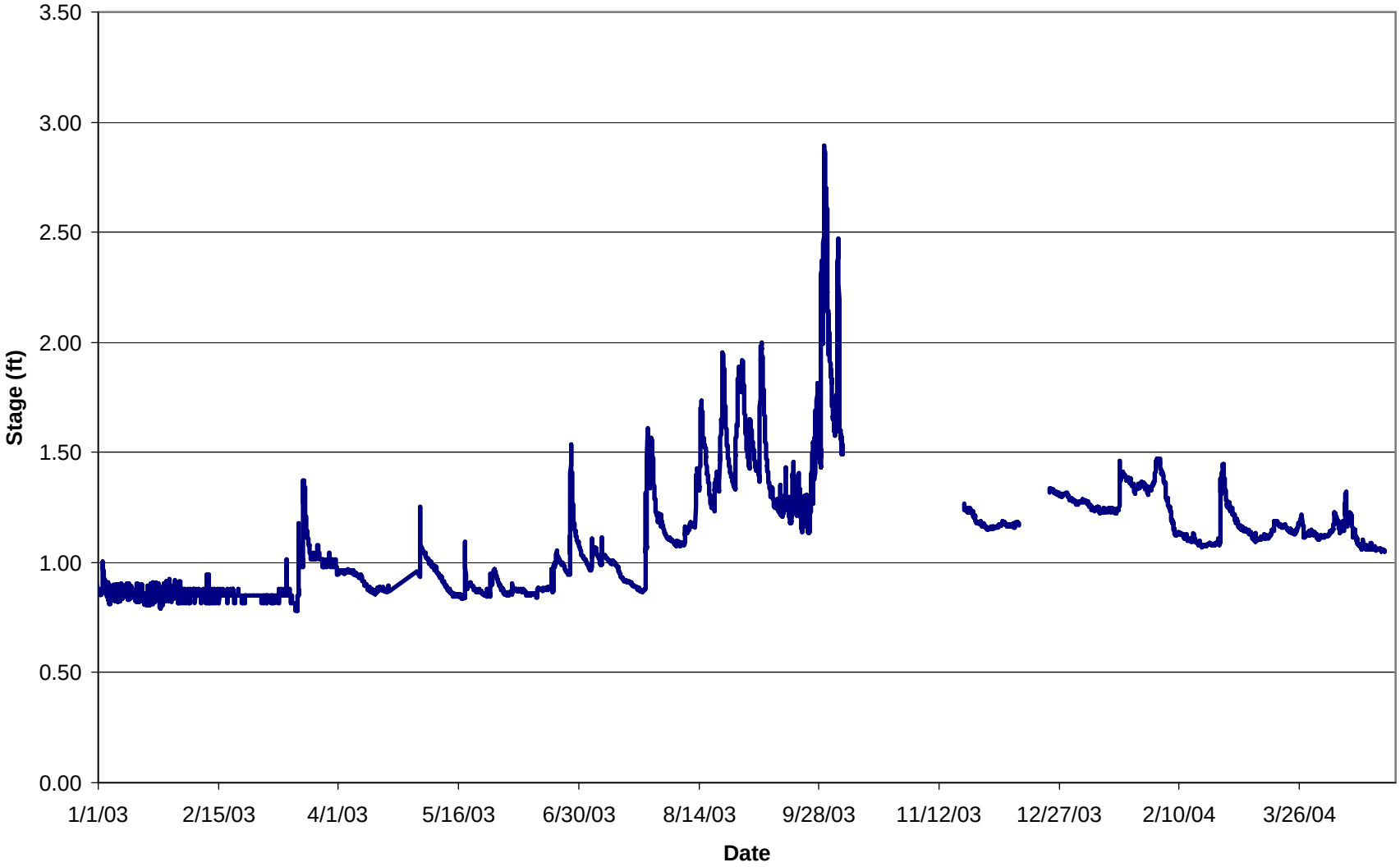
All necessary permits have been received for the original three dairy projects. The ACOE Nationwide Construction in Wetlands permit was completed for the Milking R Inc. dairy project. The primary delay in getting the permit prepared was obtaining the wetland delineation maps from the NRCS. No endangered species concerns were found for the Milking R Inc. project.

# APPENDIX A

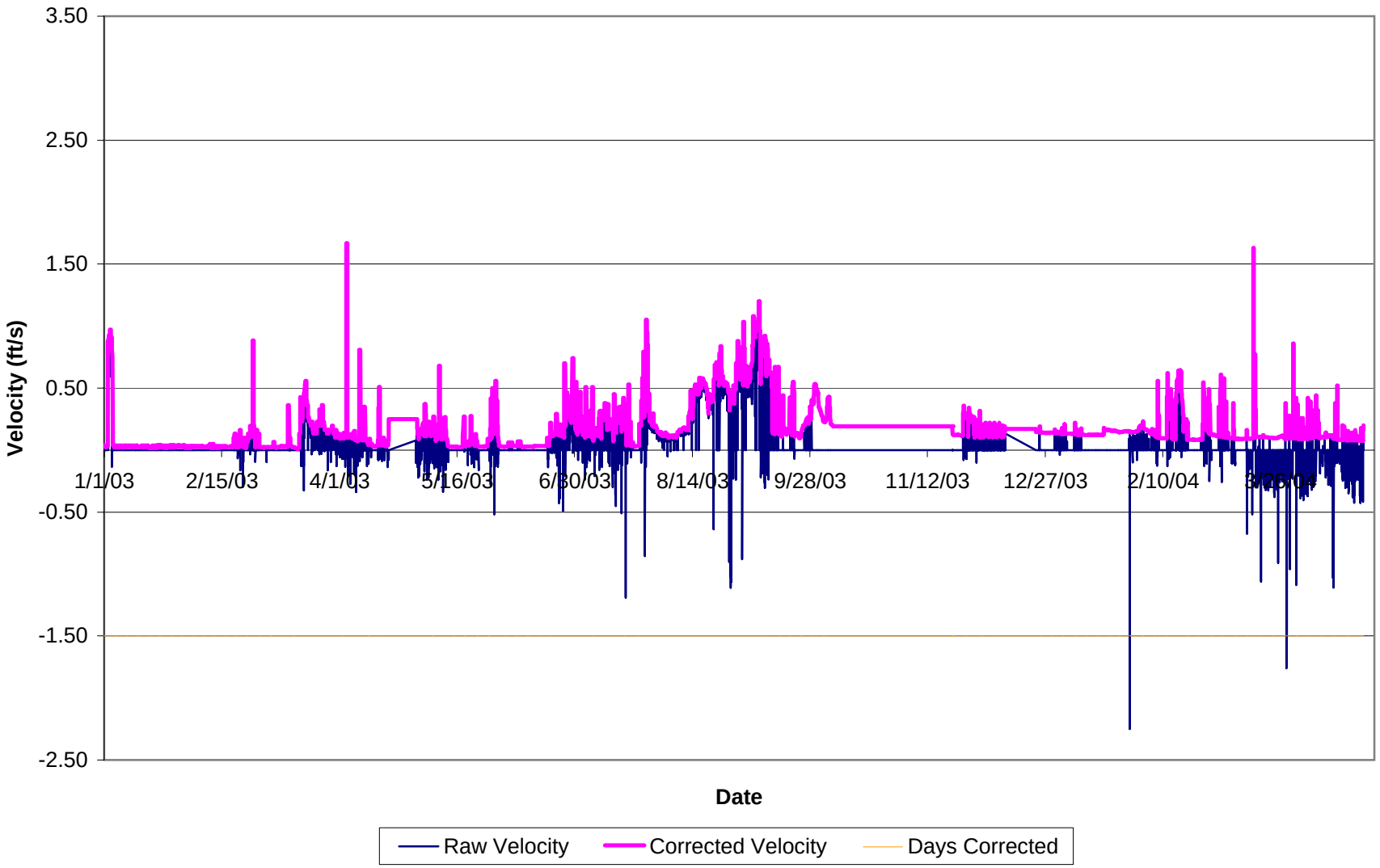
# FLOW AND WATER QUALITY DATA FOR MONITORING SITES

## List of Figure

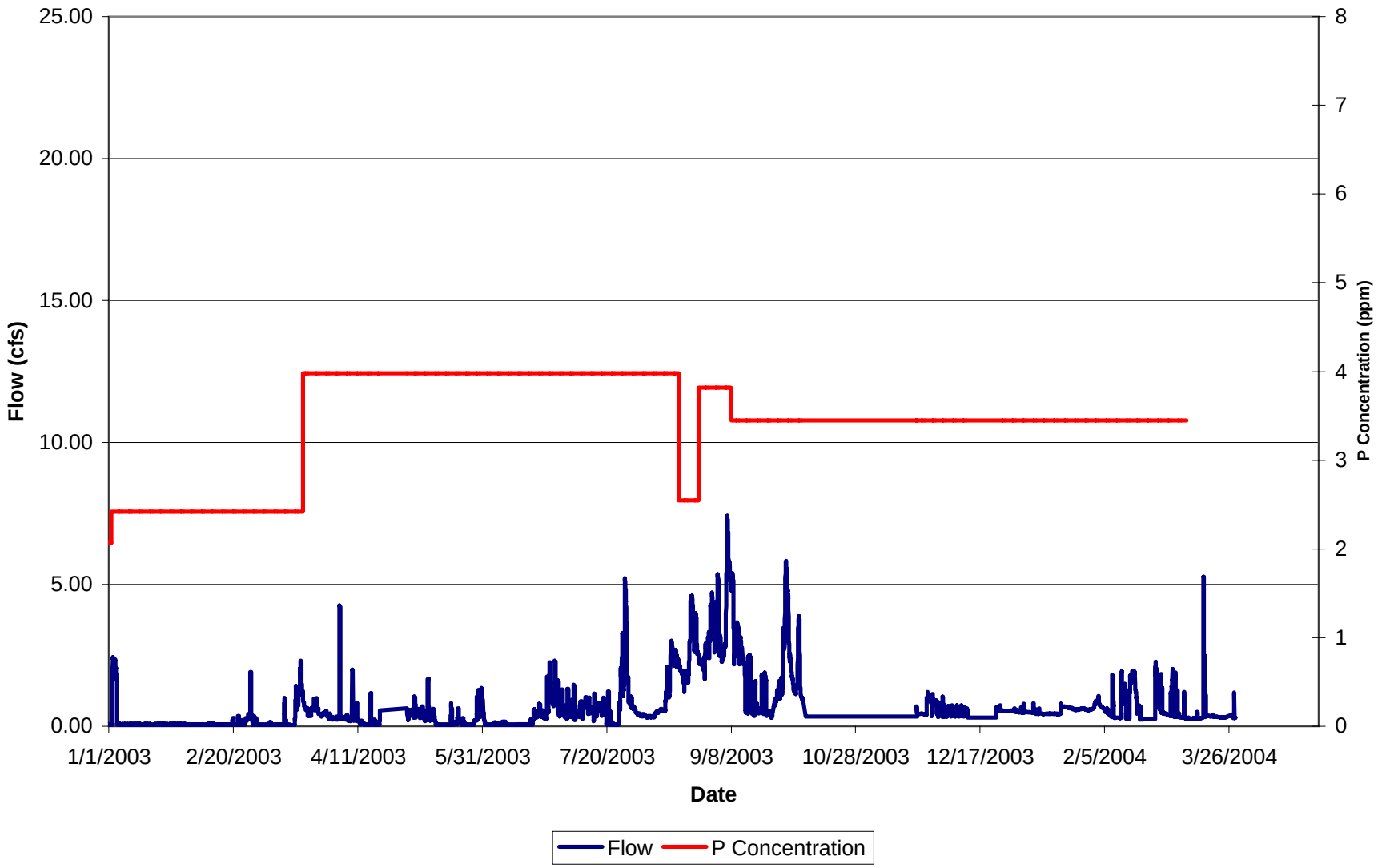
## Figure A-1. Davie North - Stage



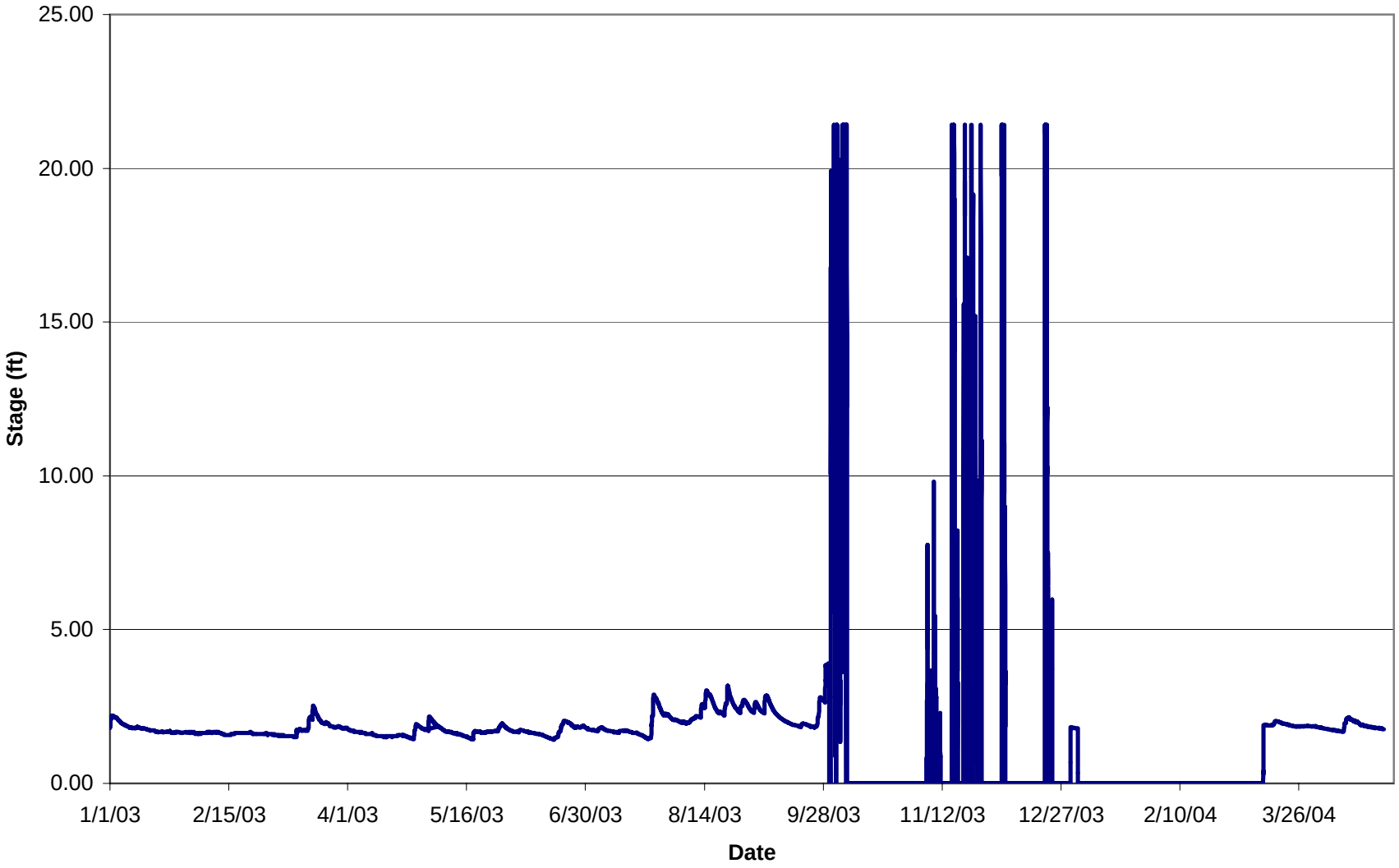
## Figure A-2. Davie North - Velocity



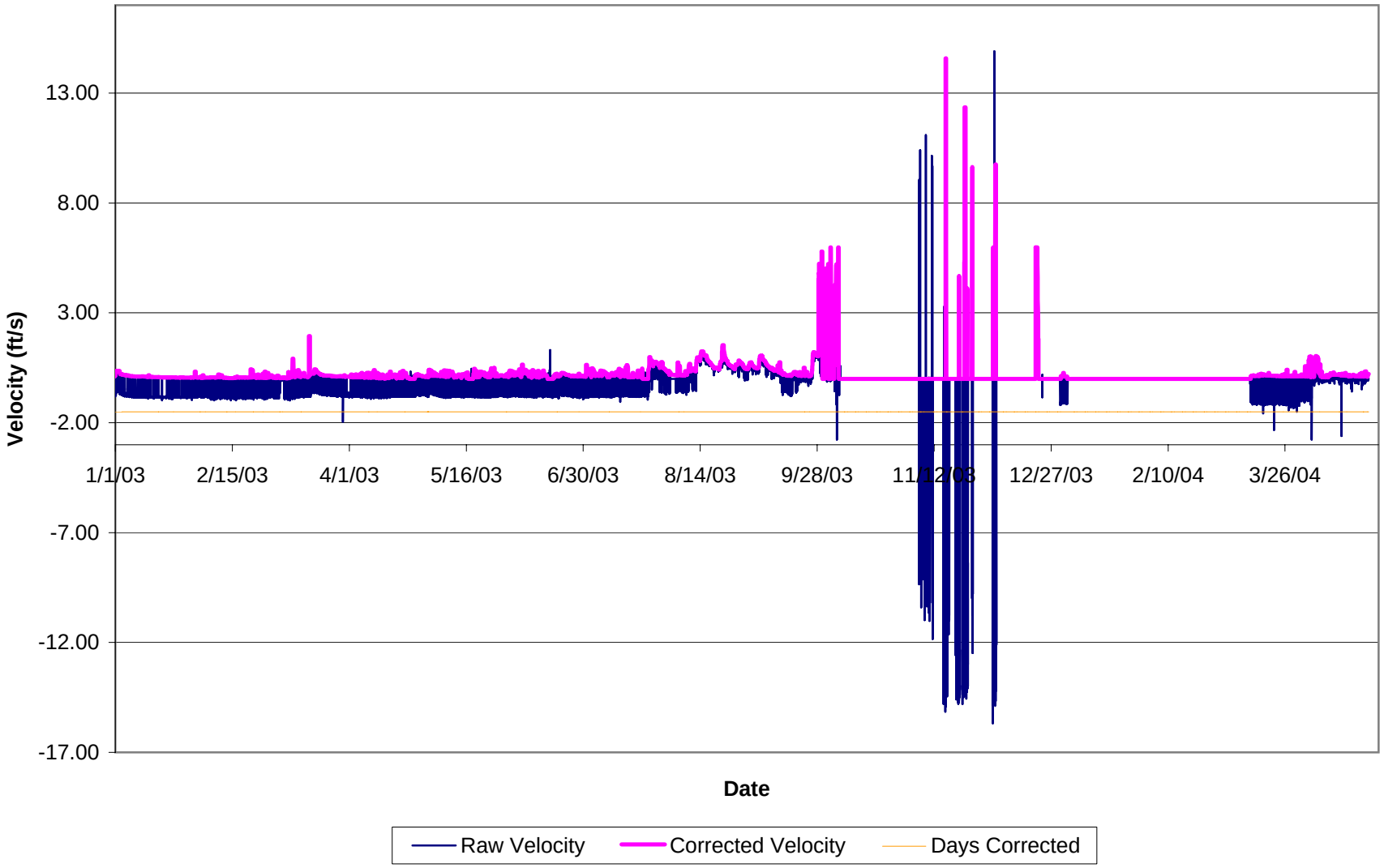
## Figure A-3. Davie North - Flow and P Concentration



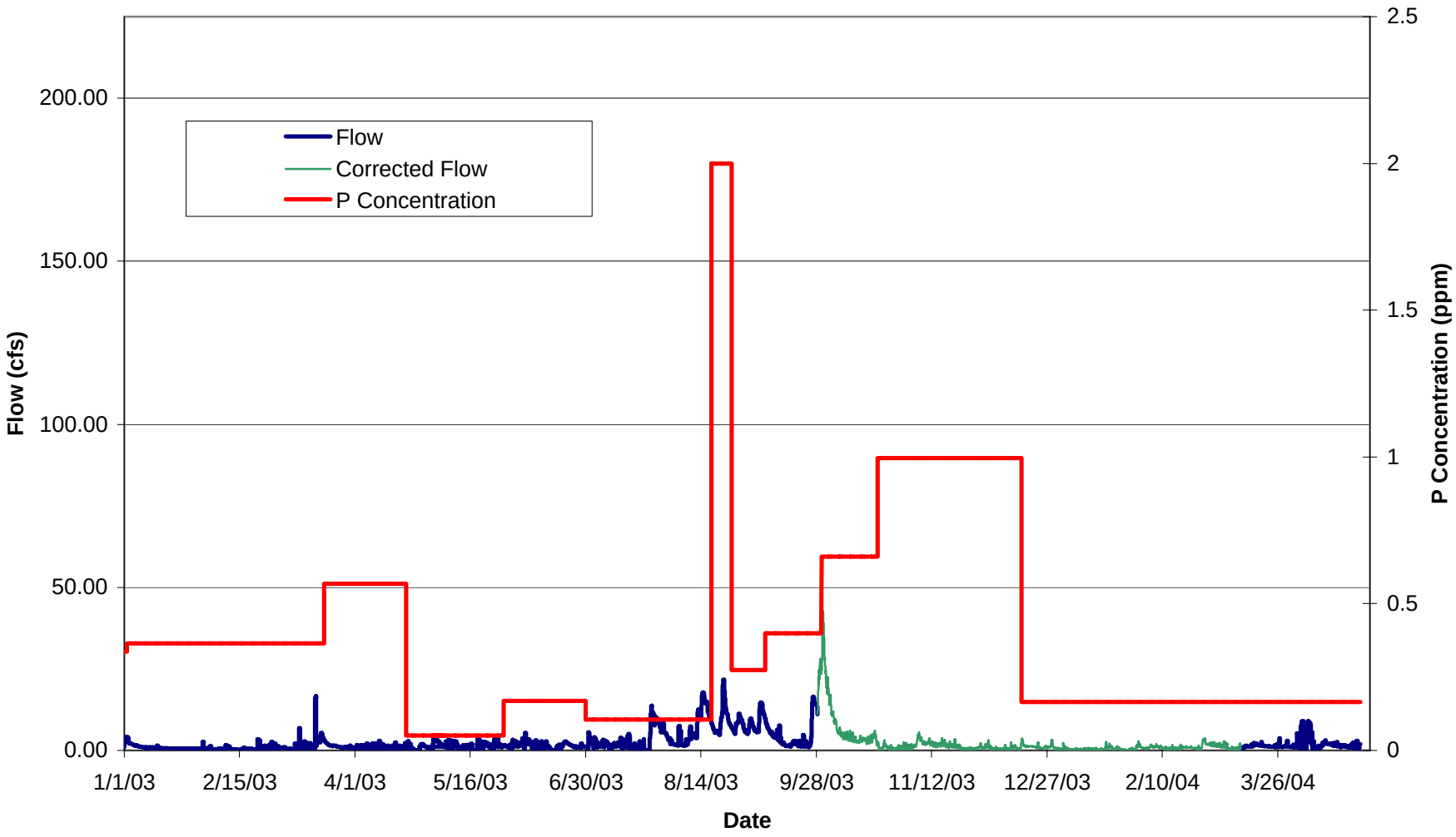
## Figure A-4. Davie East - Stage



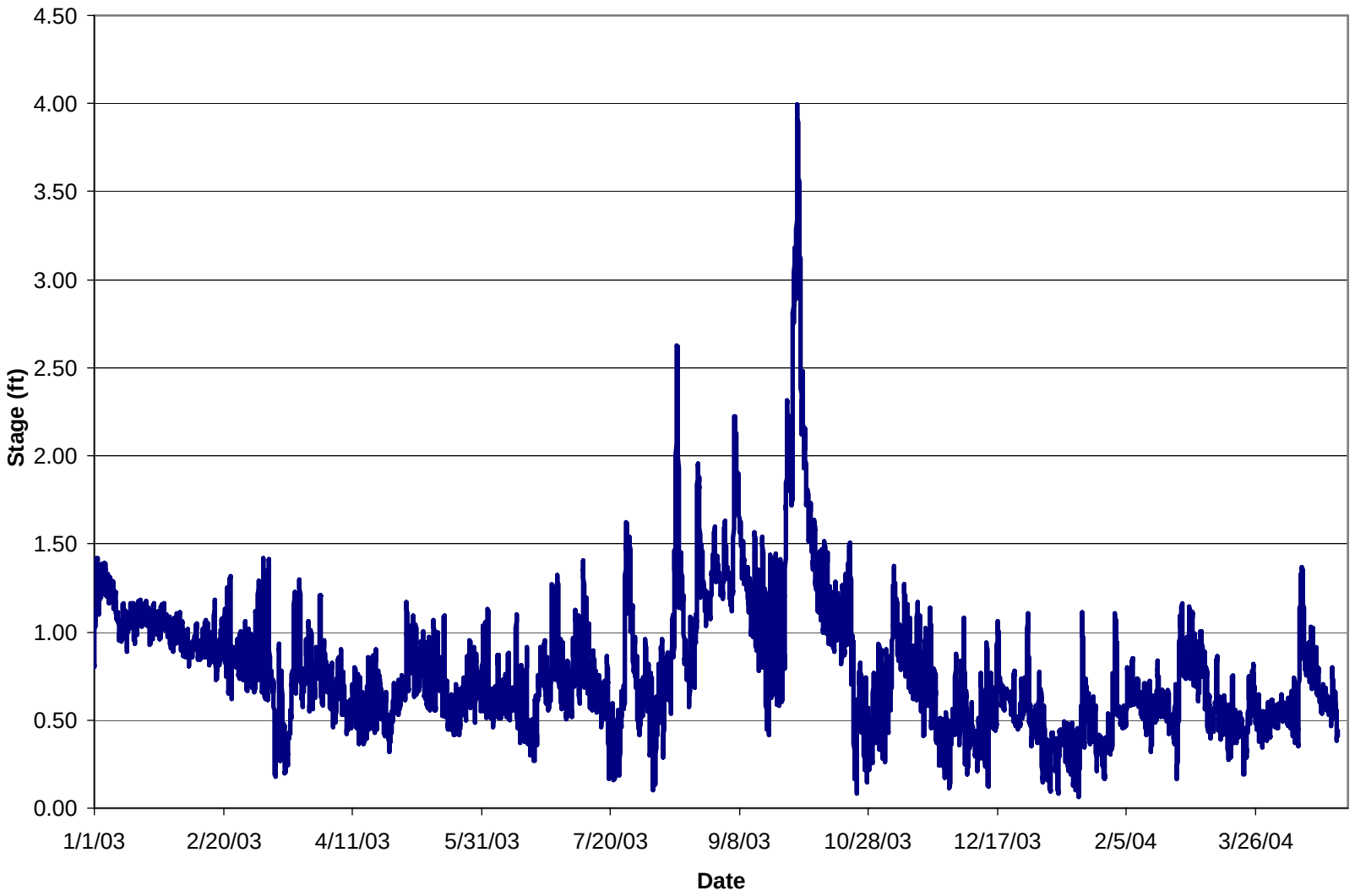
## Figure A-5. Davie East - Velocity



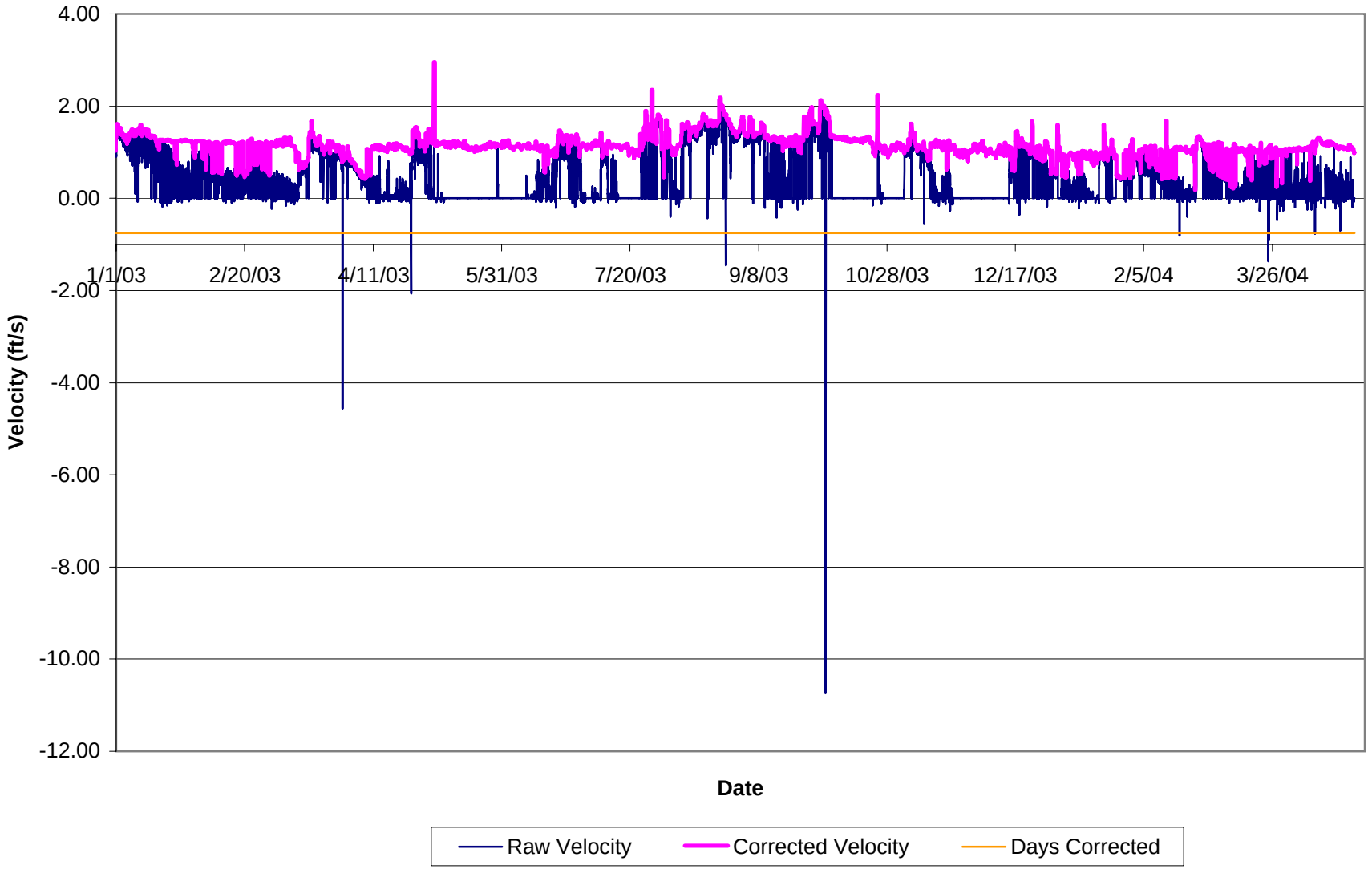
## Figure A-6. Davie East - Flow and P Concentration



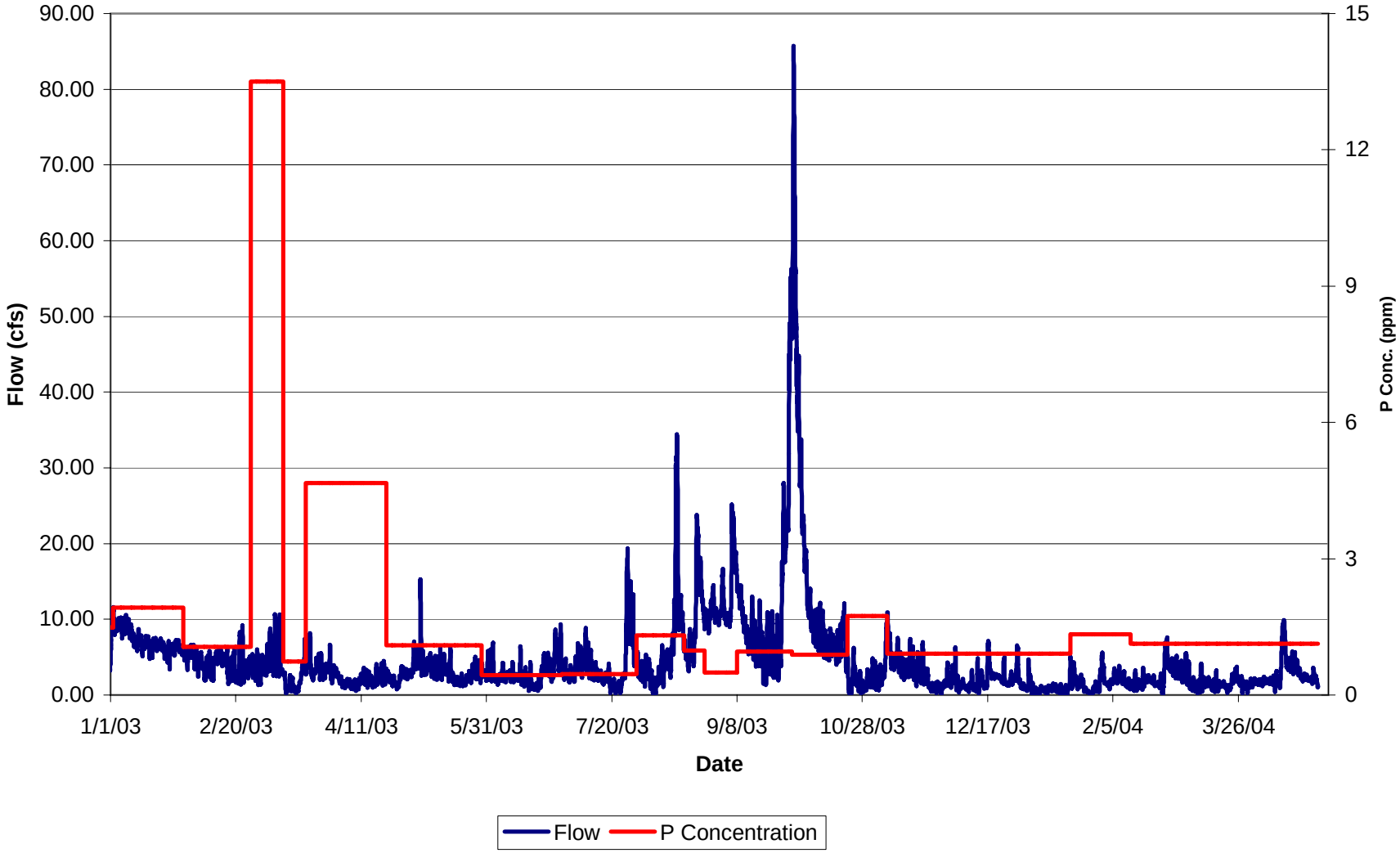
## Figure A-7. Davie South - Stage



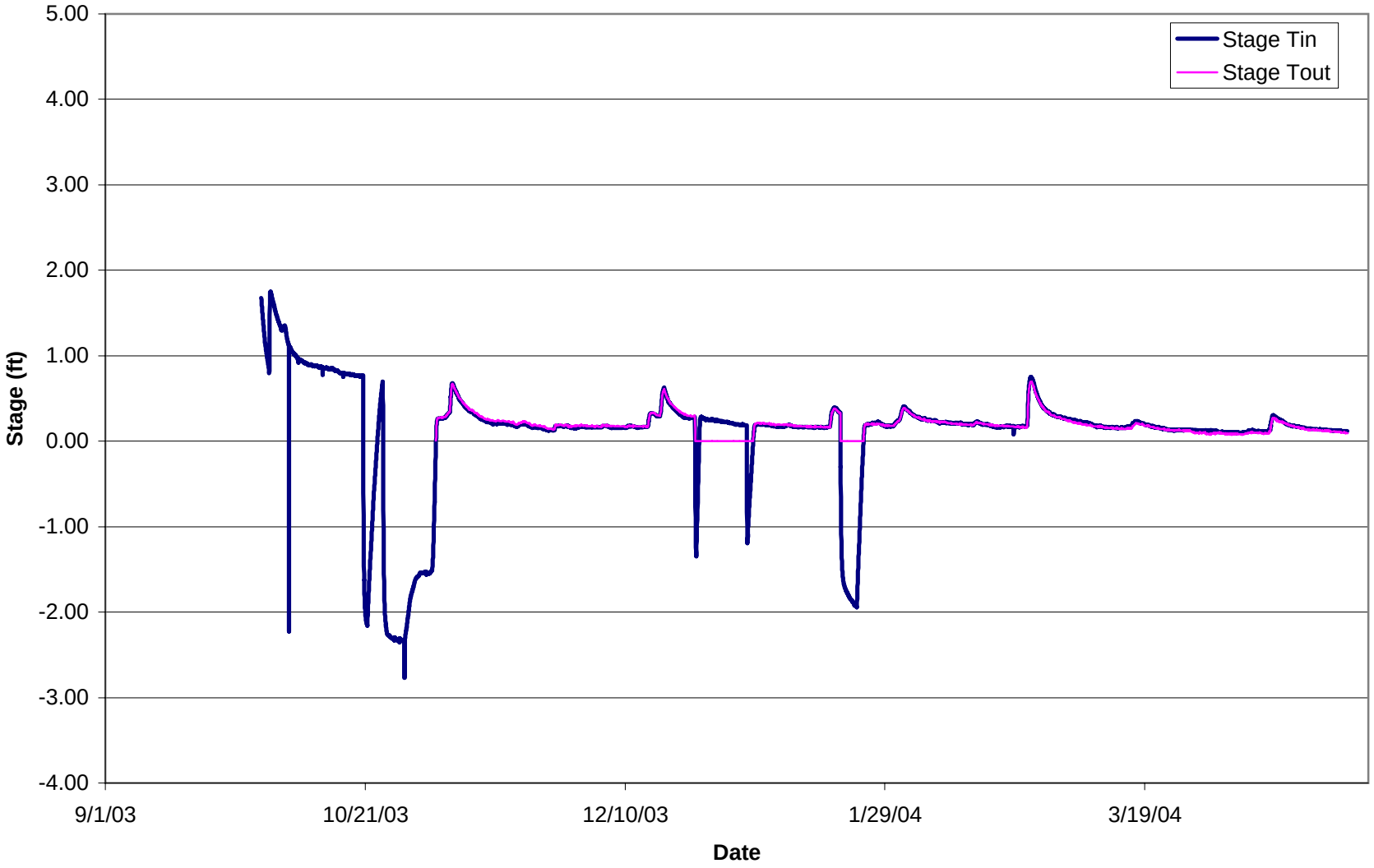
## Figure A-8. Davie South - Velocity



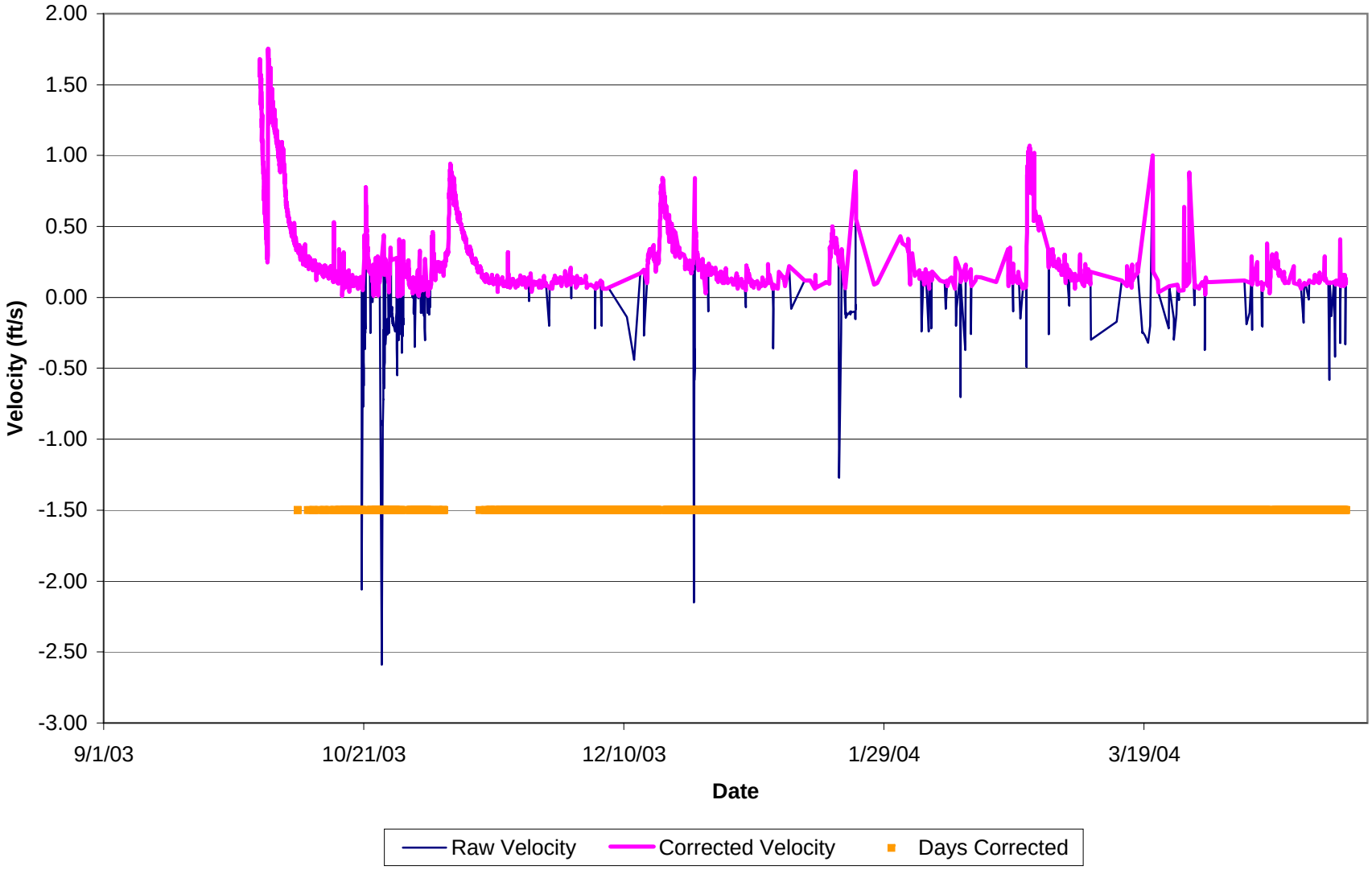
## Figure A-9. Davie South - Flow and P Concentration



## Figure A-10. Davie T-In - Stage



## Figure A-11. Davie T-In - Velocity



## Figure A-12. Davie T-In - Flow and P Concentration

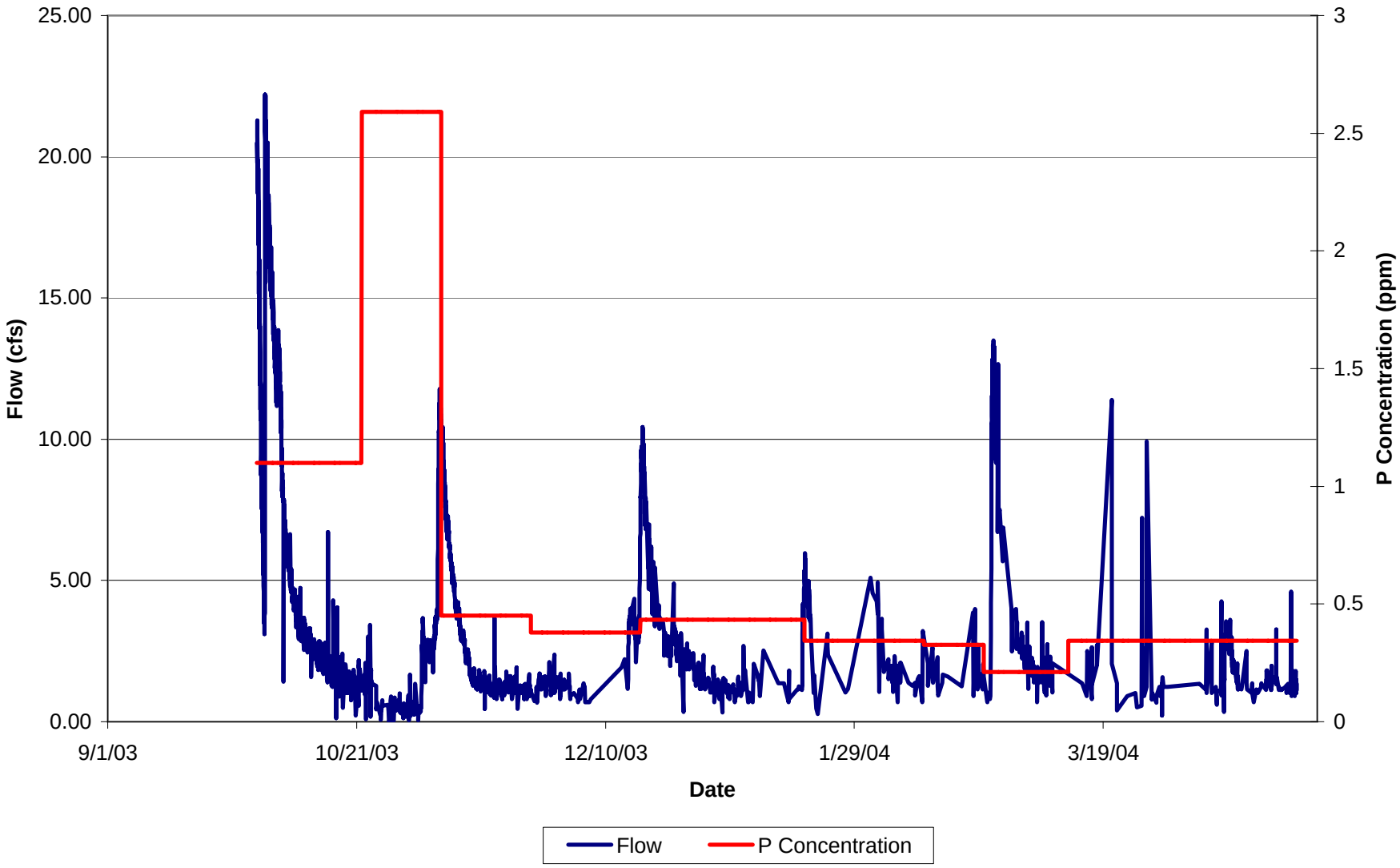
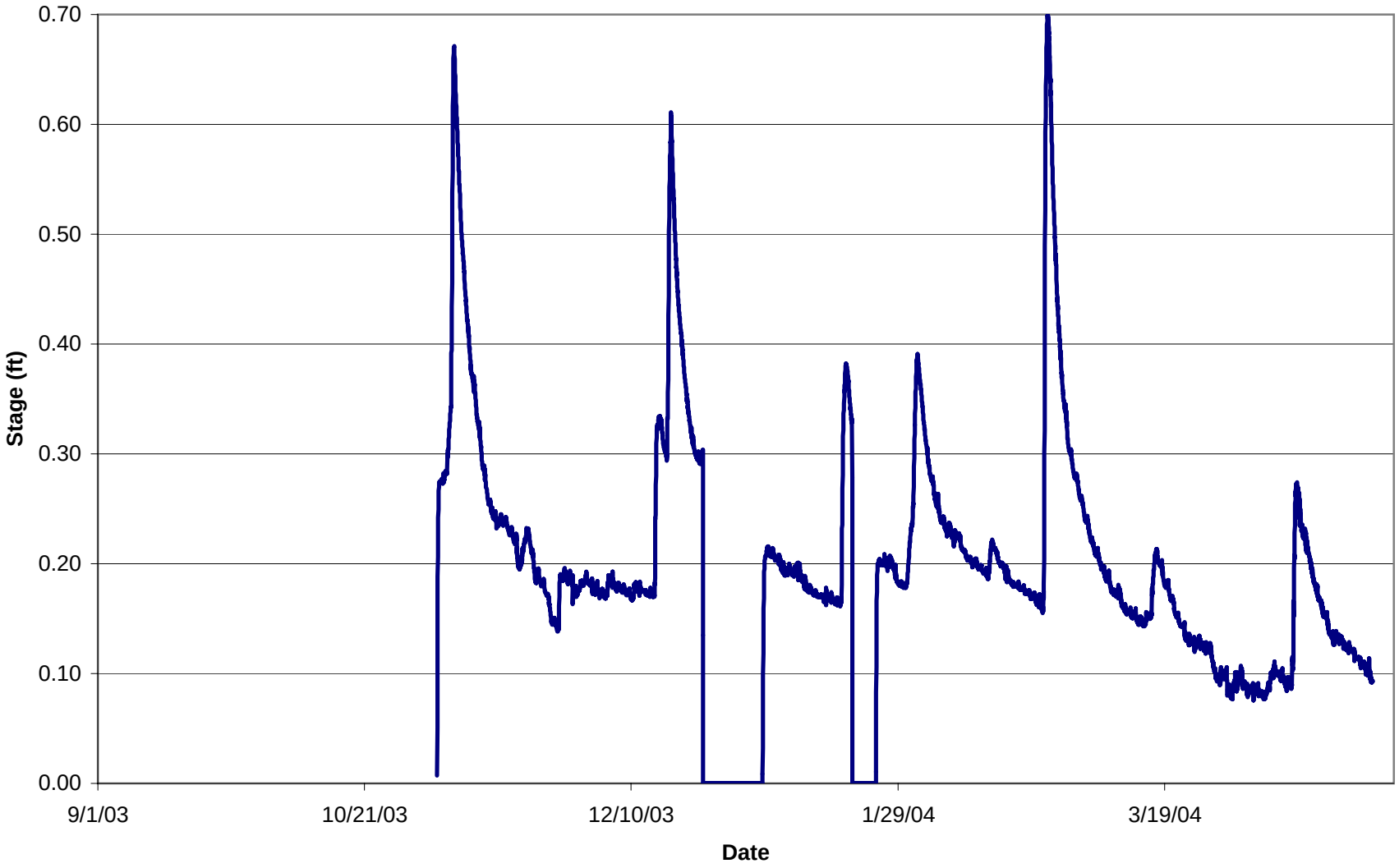
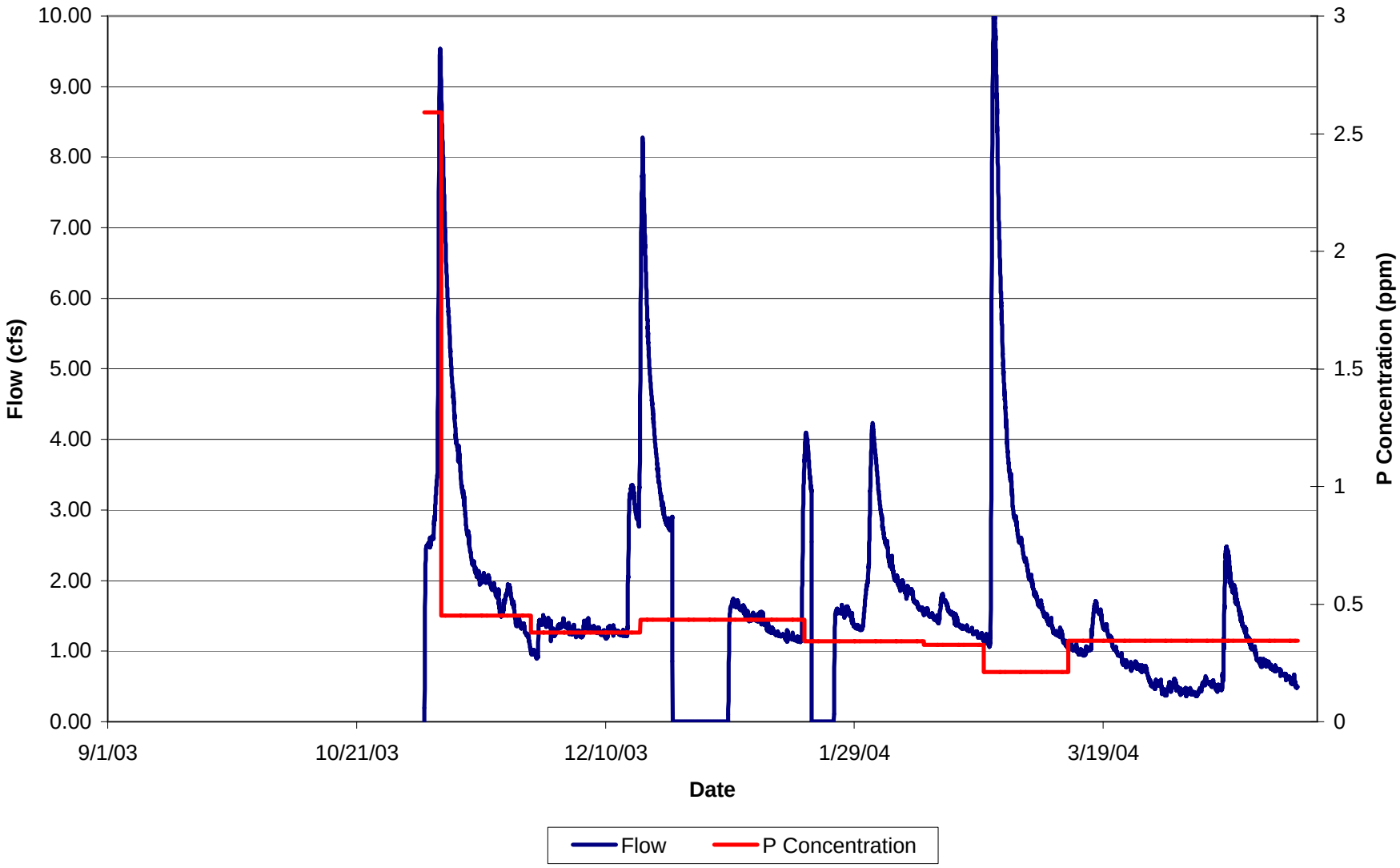


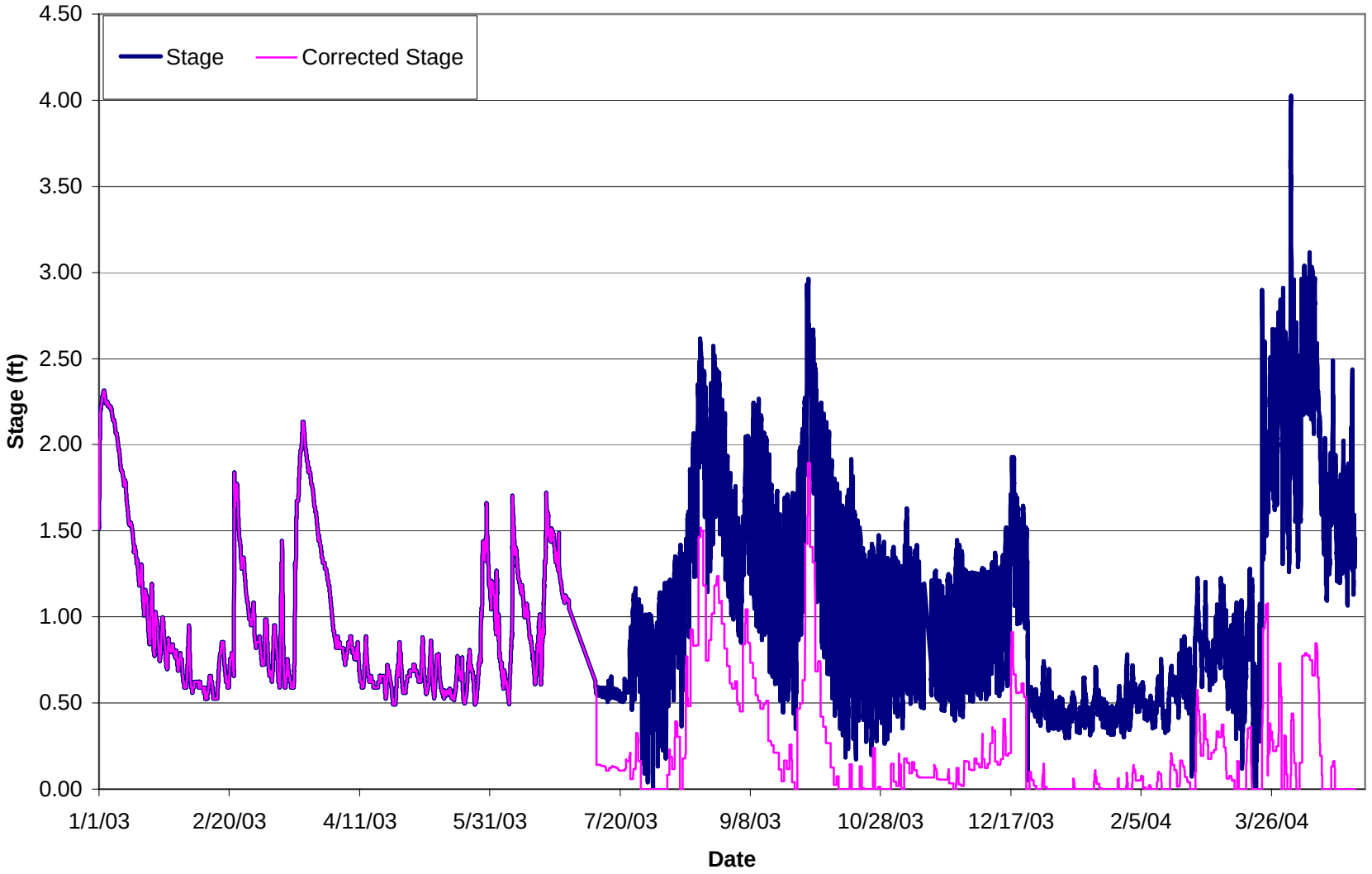
**Figure A-13. Davie T-Out - Stage**



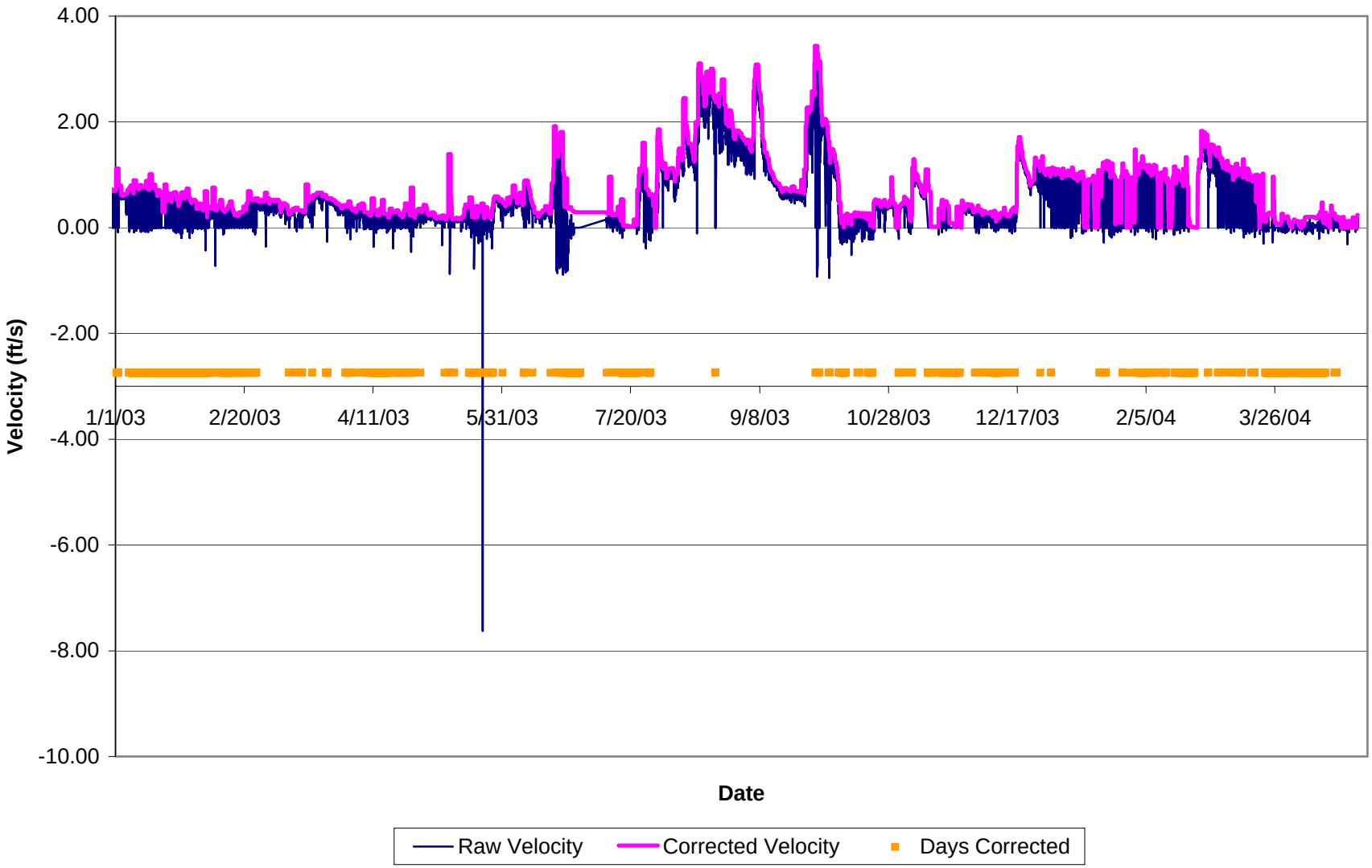
## Figure A-14. Davie T-Out - Flow and P Concentration



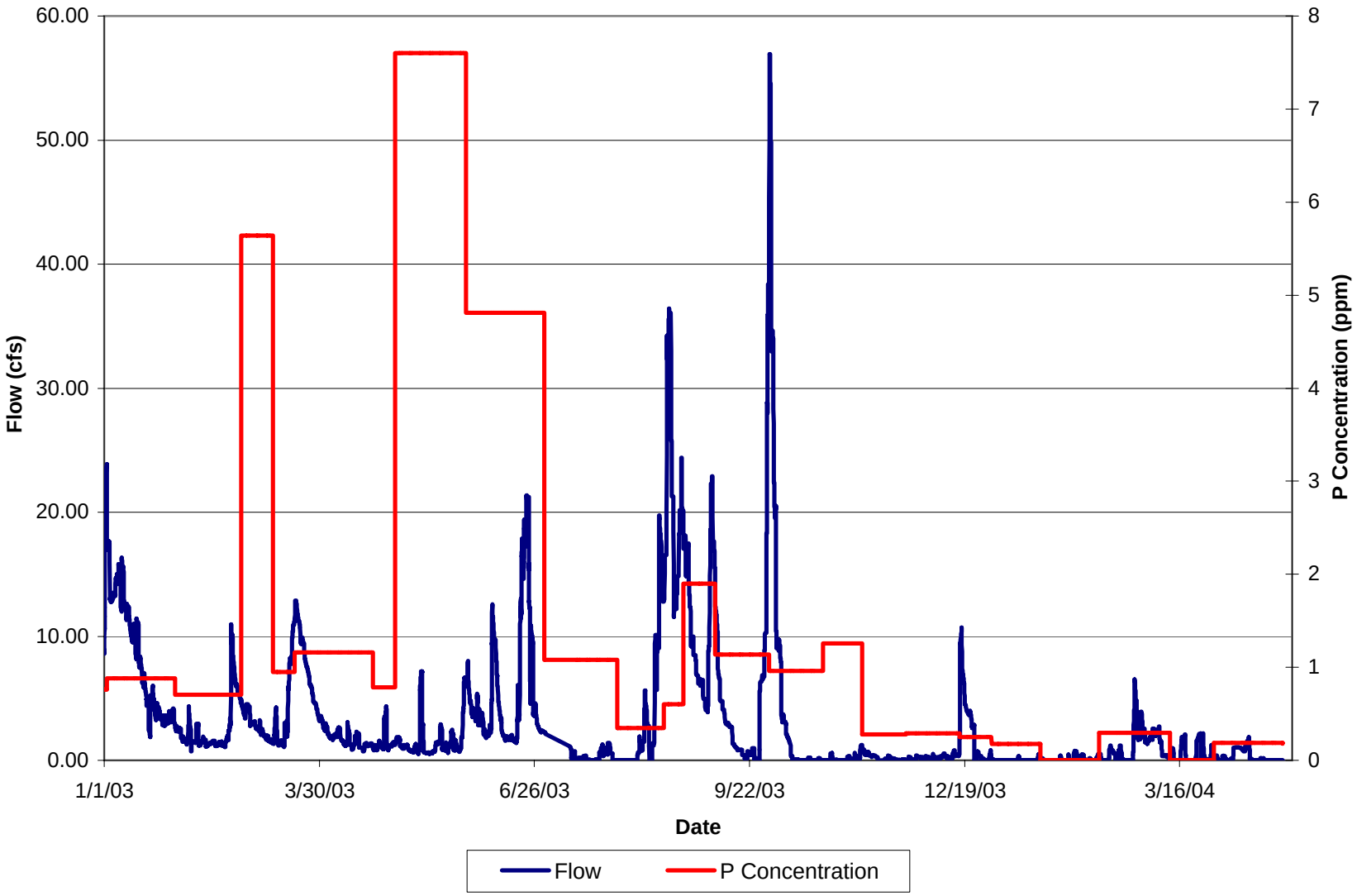
## Figure A-15. KREA 41A - Stage



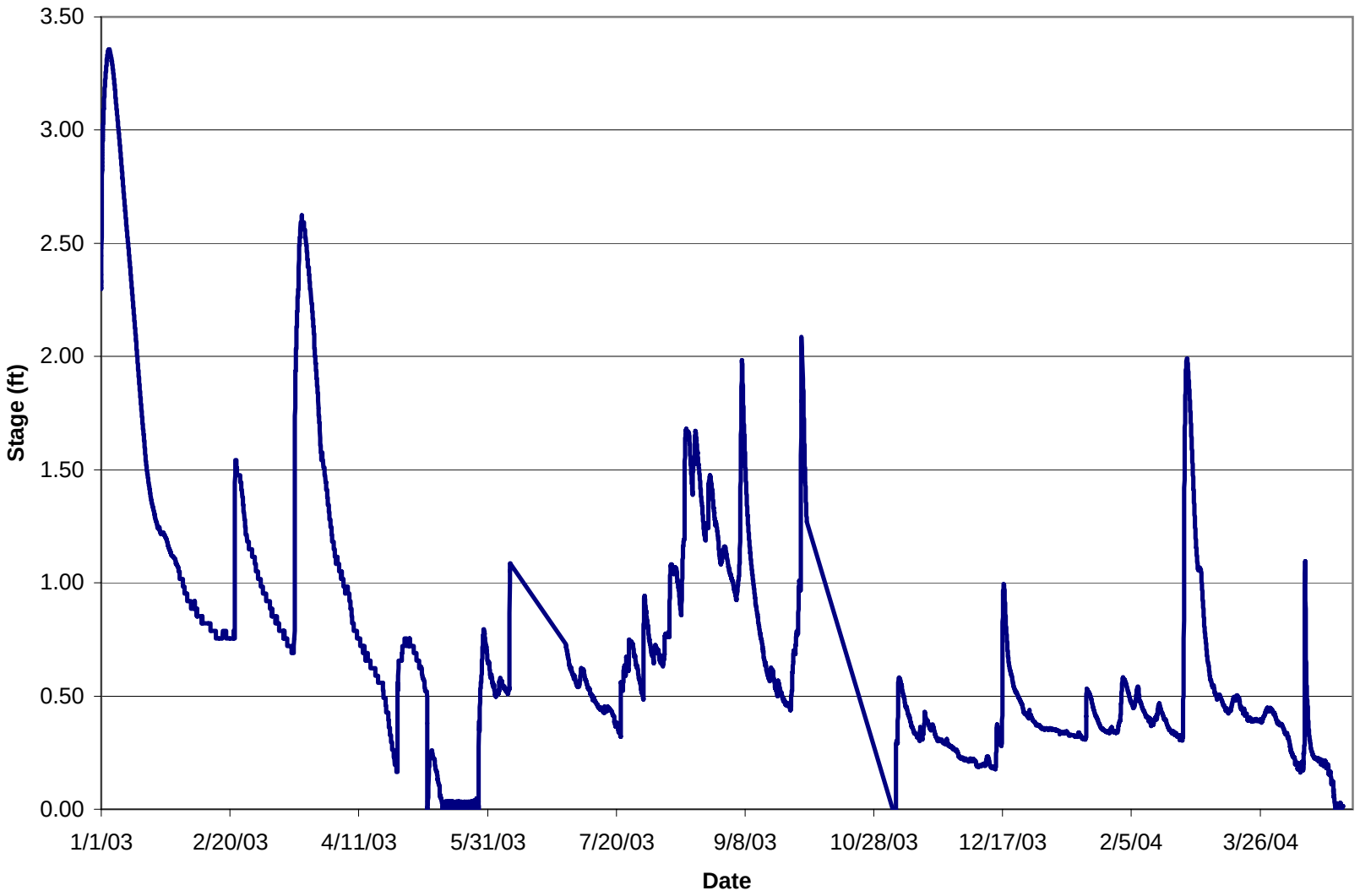
## Figure A-16. KREA 41A - Velocity



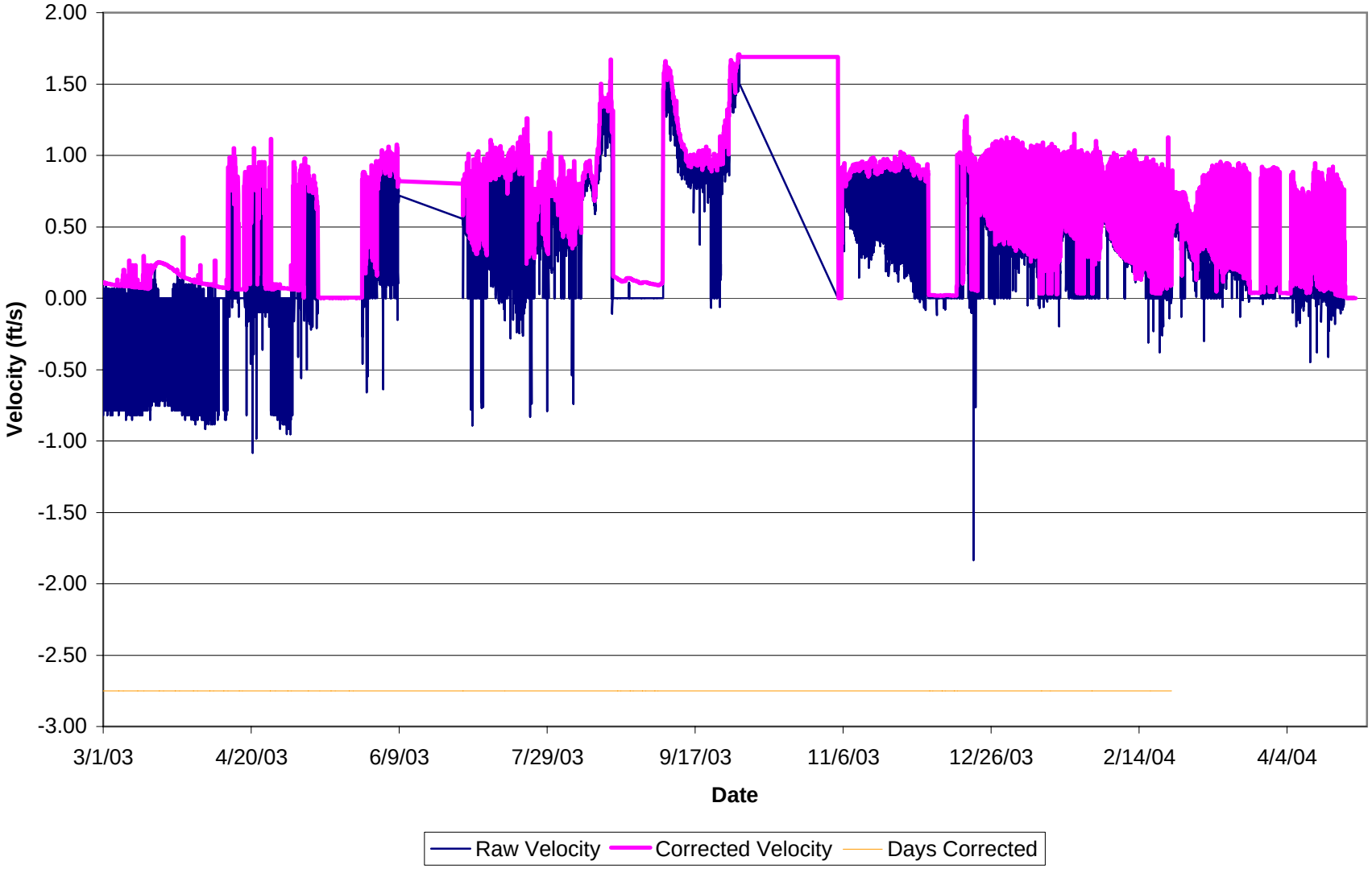
## Figure A-17. KREA 41A - Flow and P Concentration



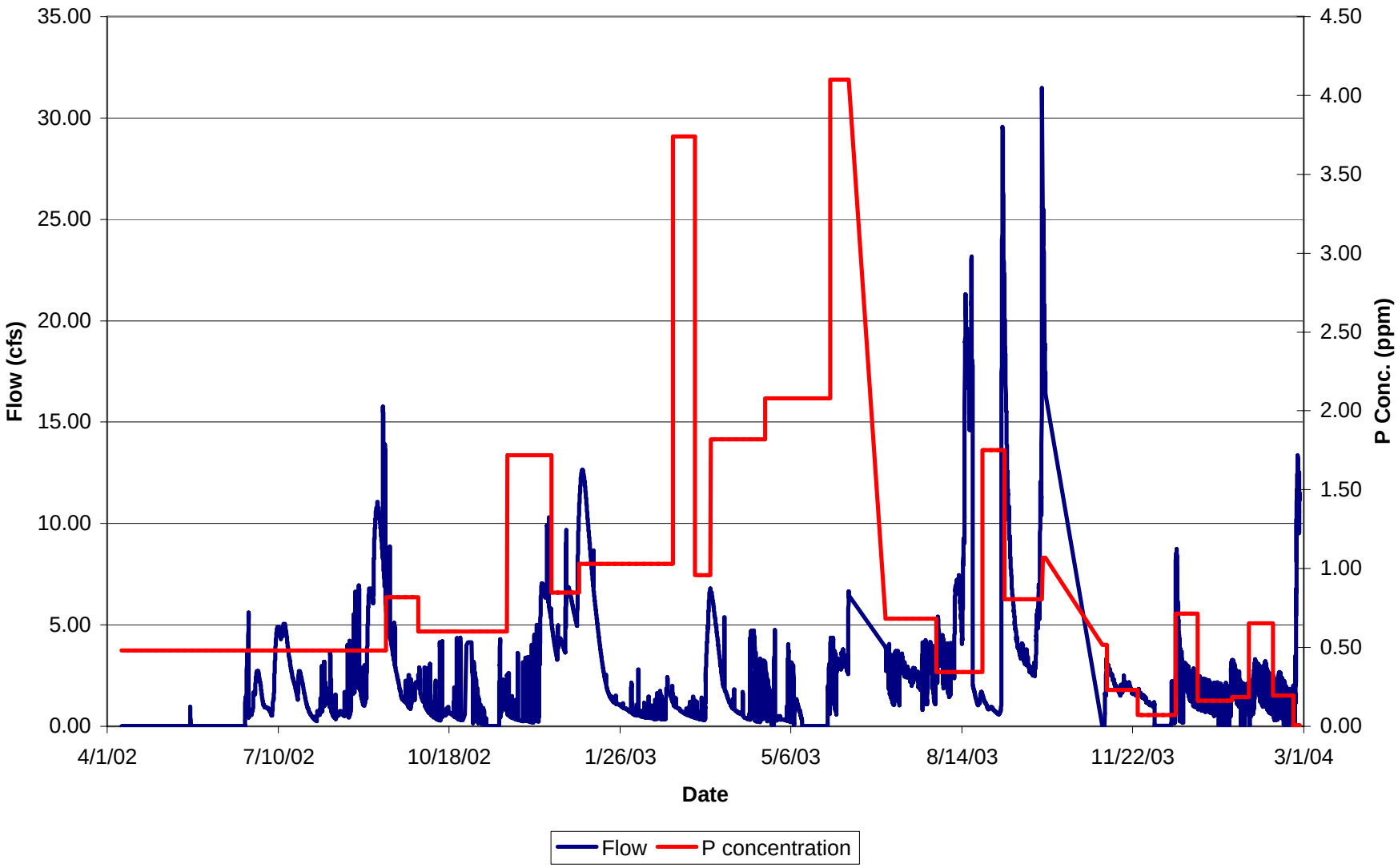
## Figure A - 18. KREA 10D - Stage



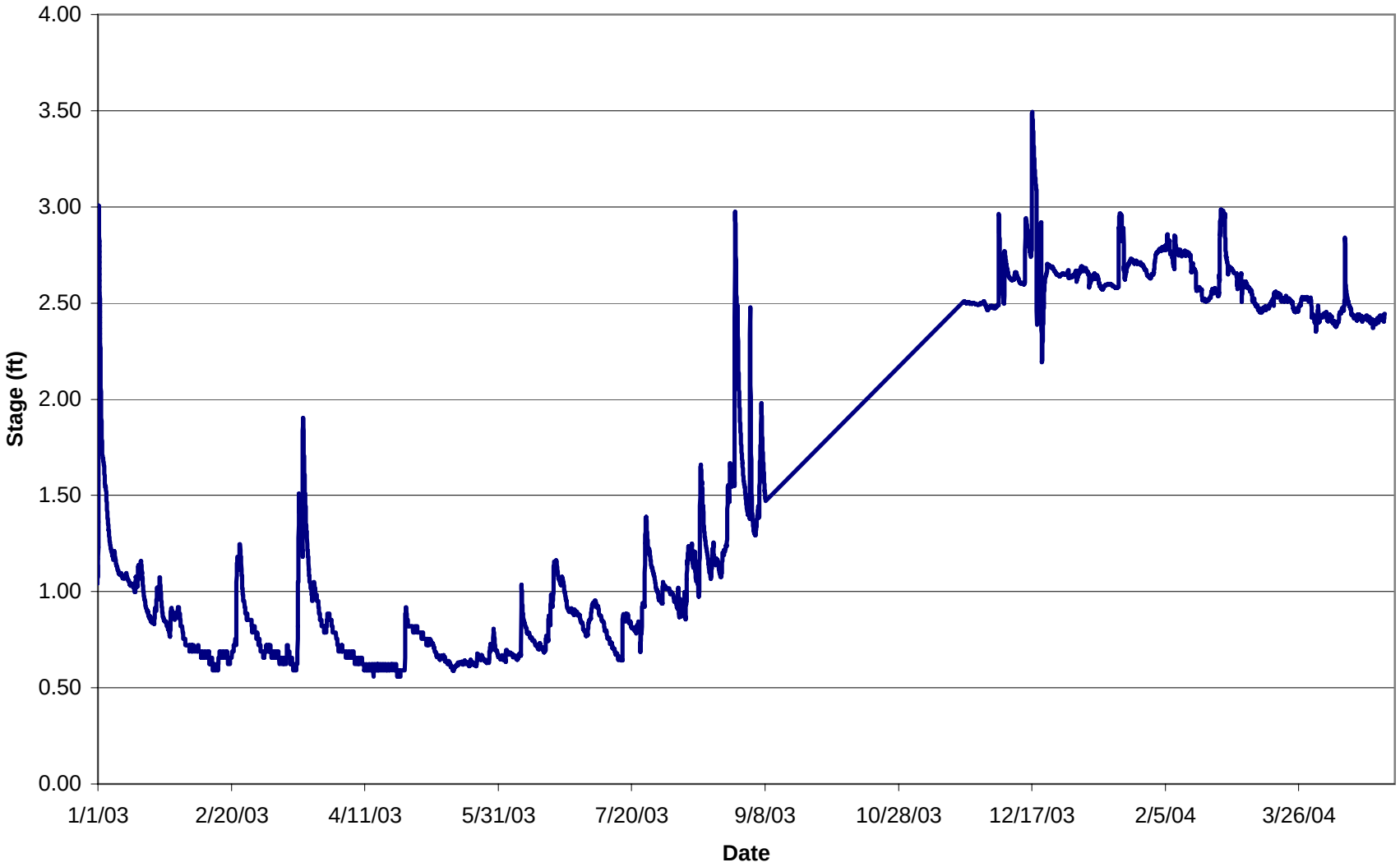
## Figure A- 19. KREA 10D - Velocity



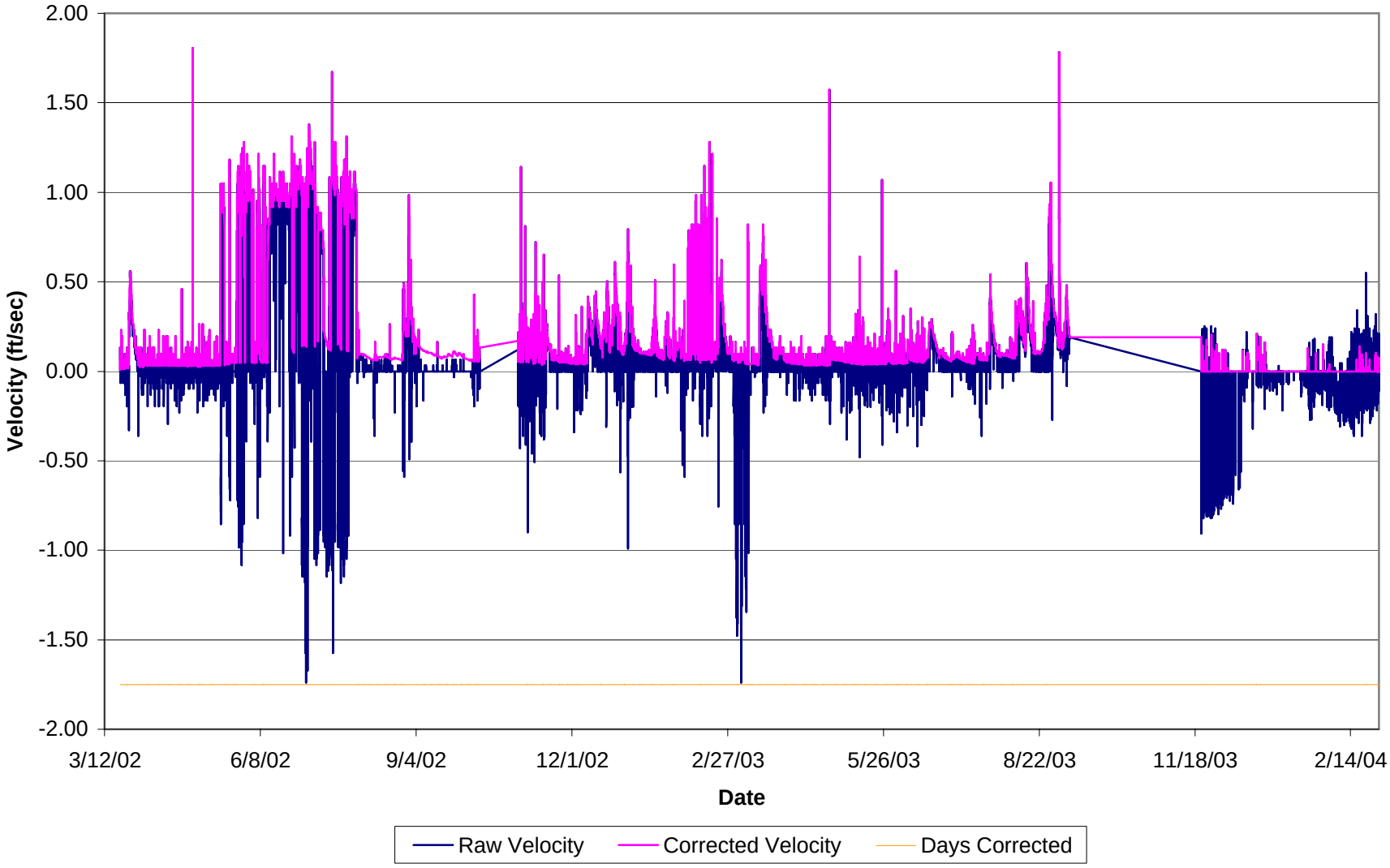
## Figure A-20. KREA 10D - Flow and P Concentration



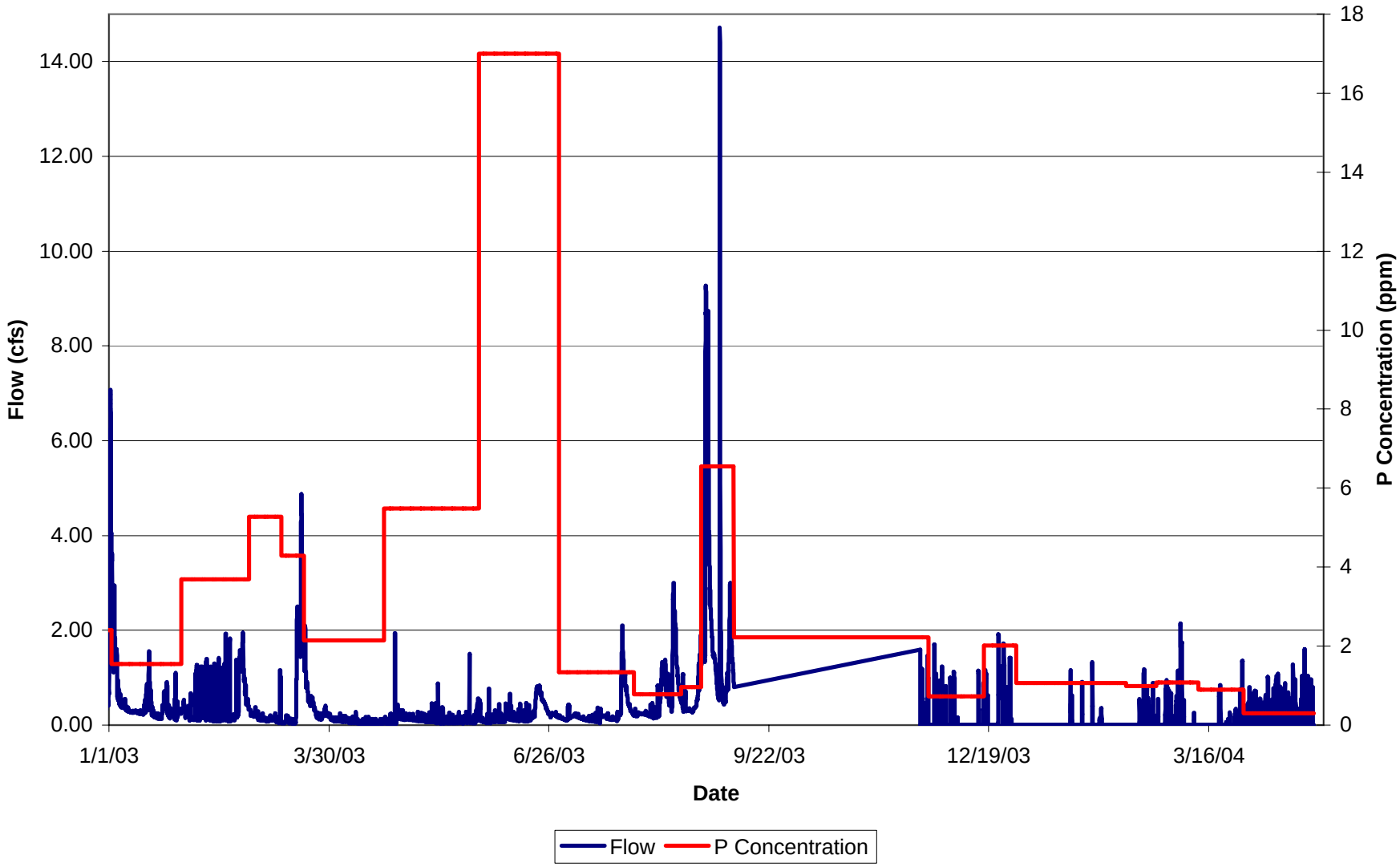
## Figure A-21. KREA 32B - Stage



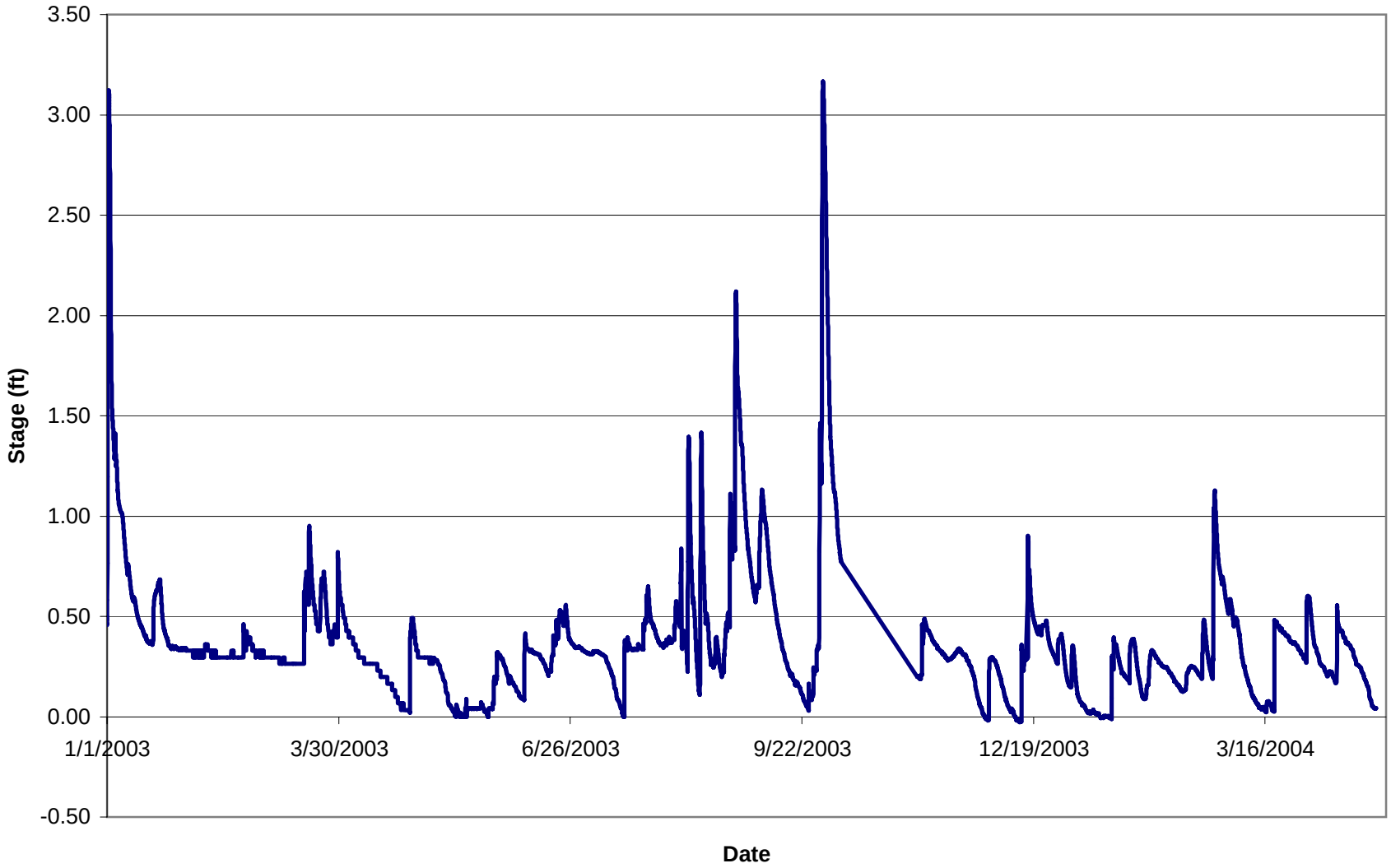
## Figure A-22. KREA 32B - Velocity



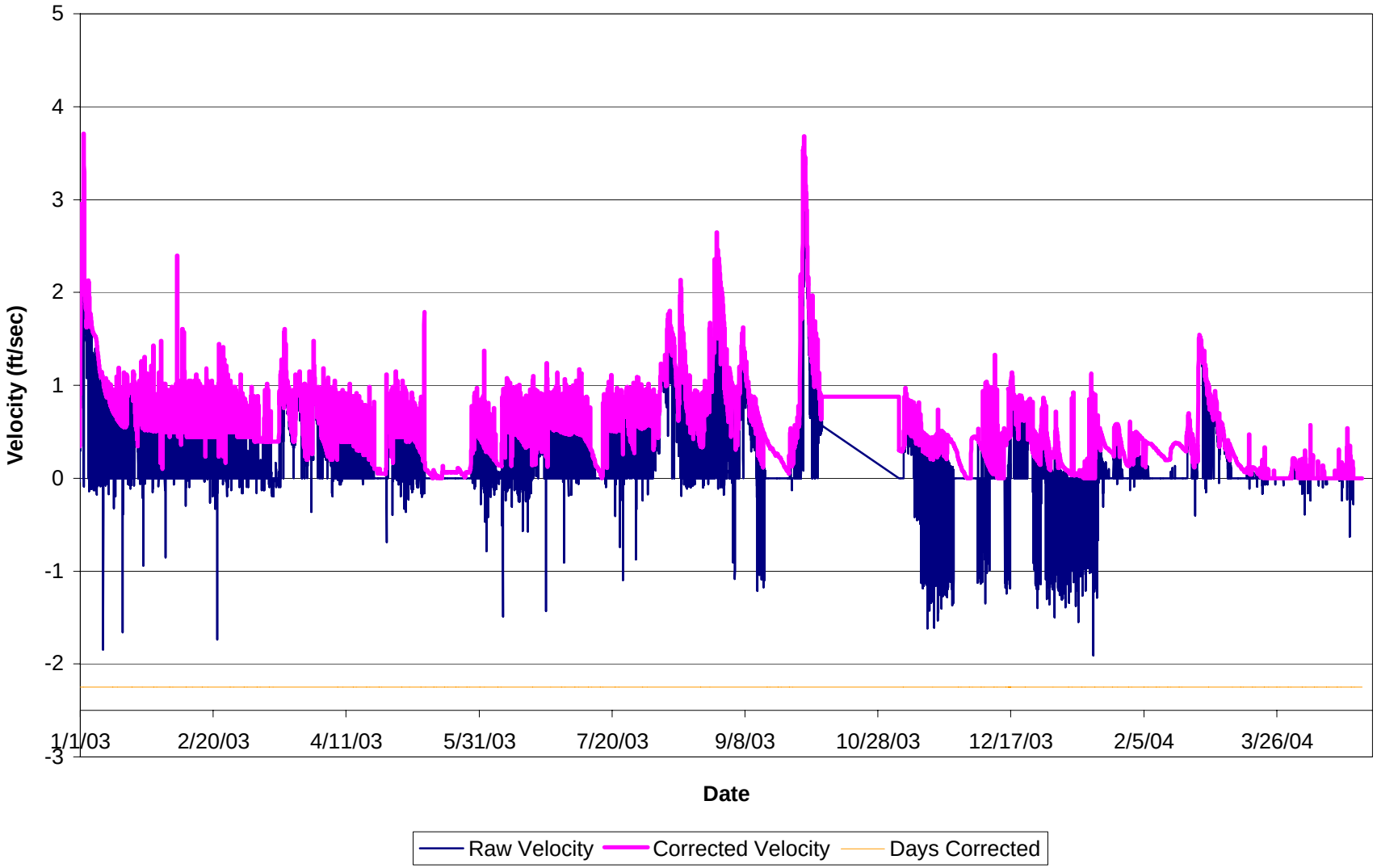
## Figure A-23. KREA 32B - Flow and P Concentration



## Figure A-24. KRE49A - Stage



## Figure A-25. KREA 49A - Velocity



## Figure A-26. KREA 49A - Flow and P Concentration

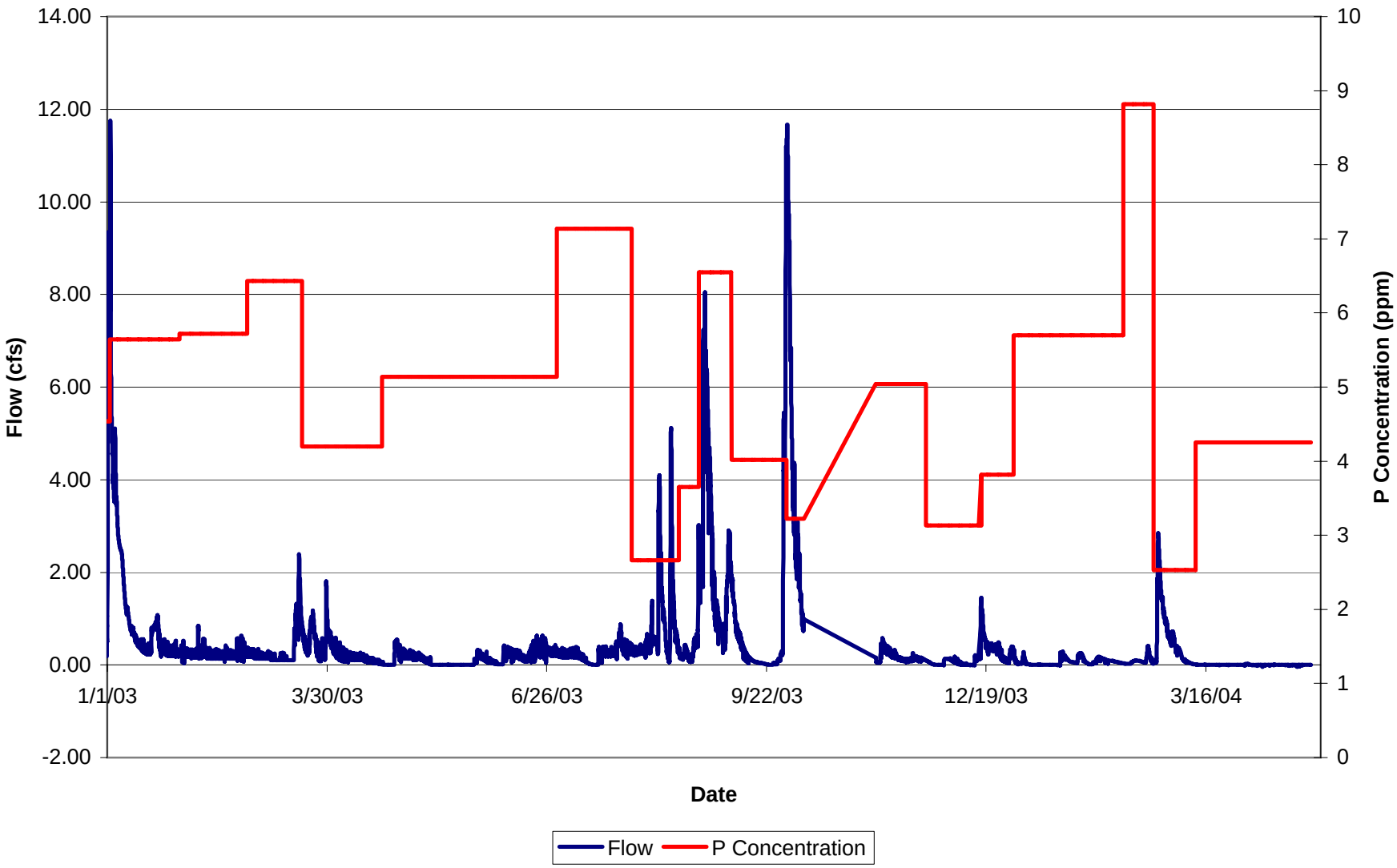


**Figure A-27. Total P Concentrations at Monitoring Sites**

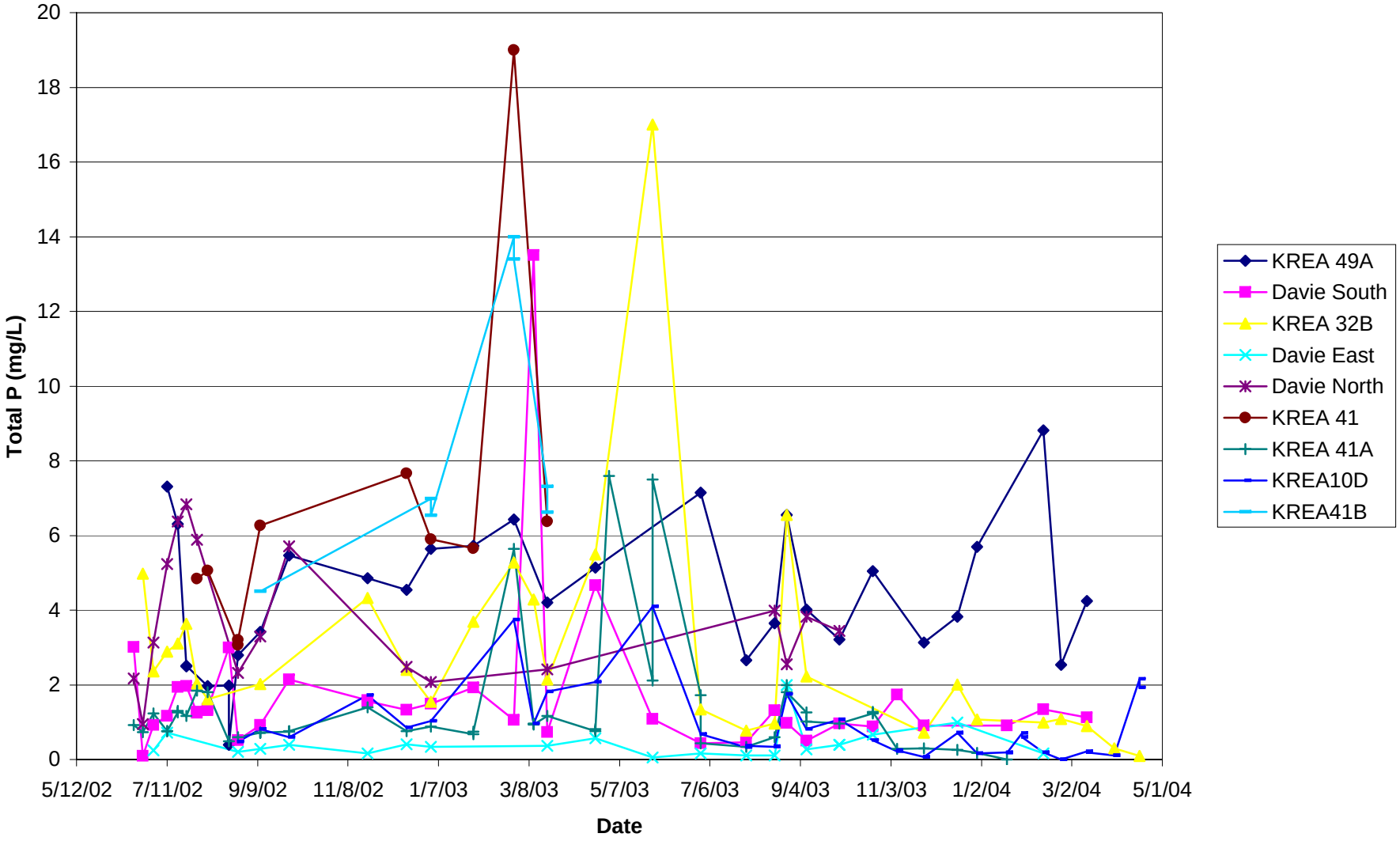


**Figure A-28. Fecal Coliform at Monitoring Sites**

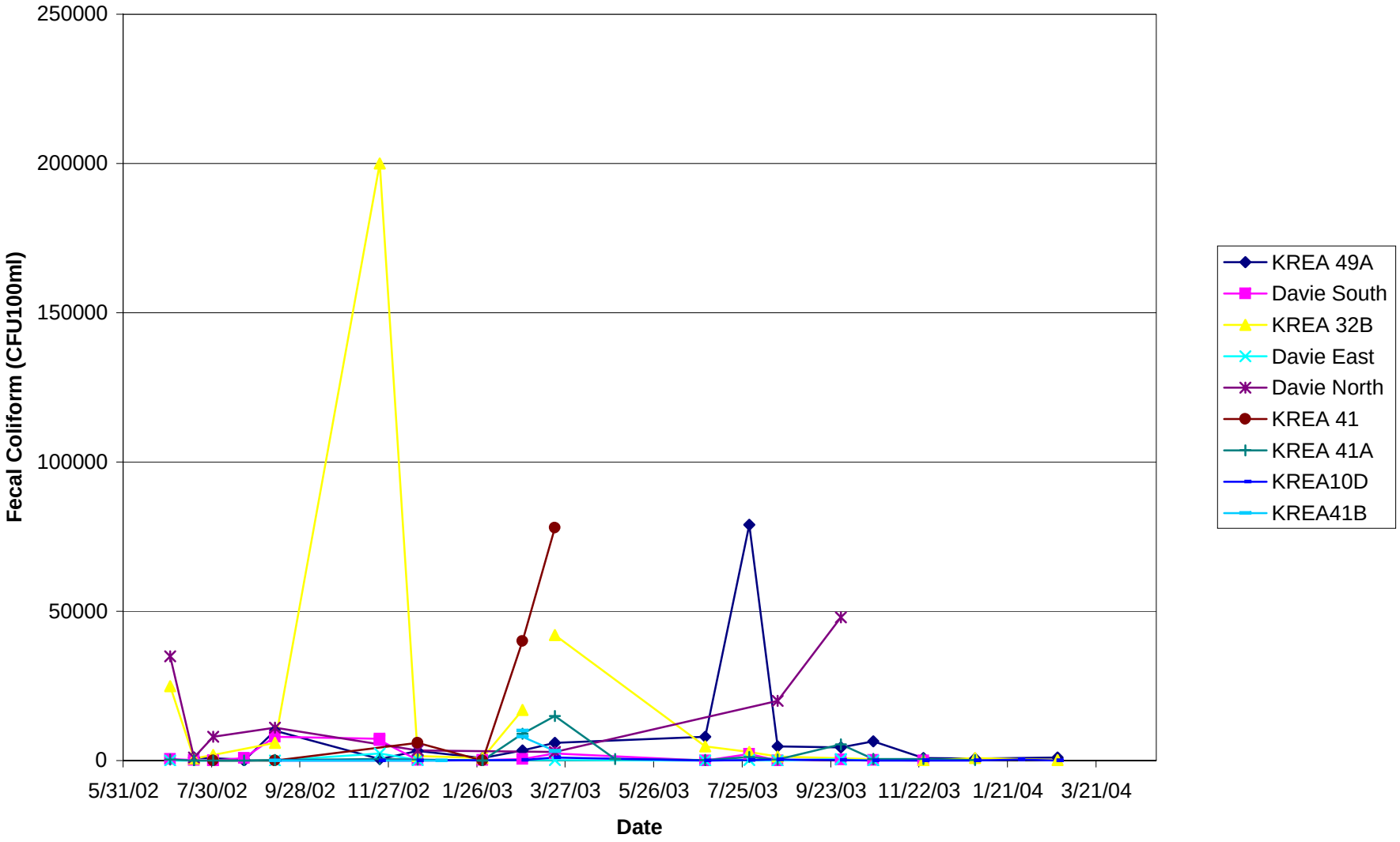
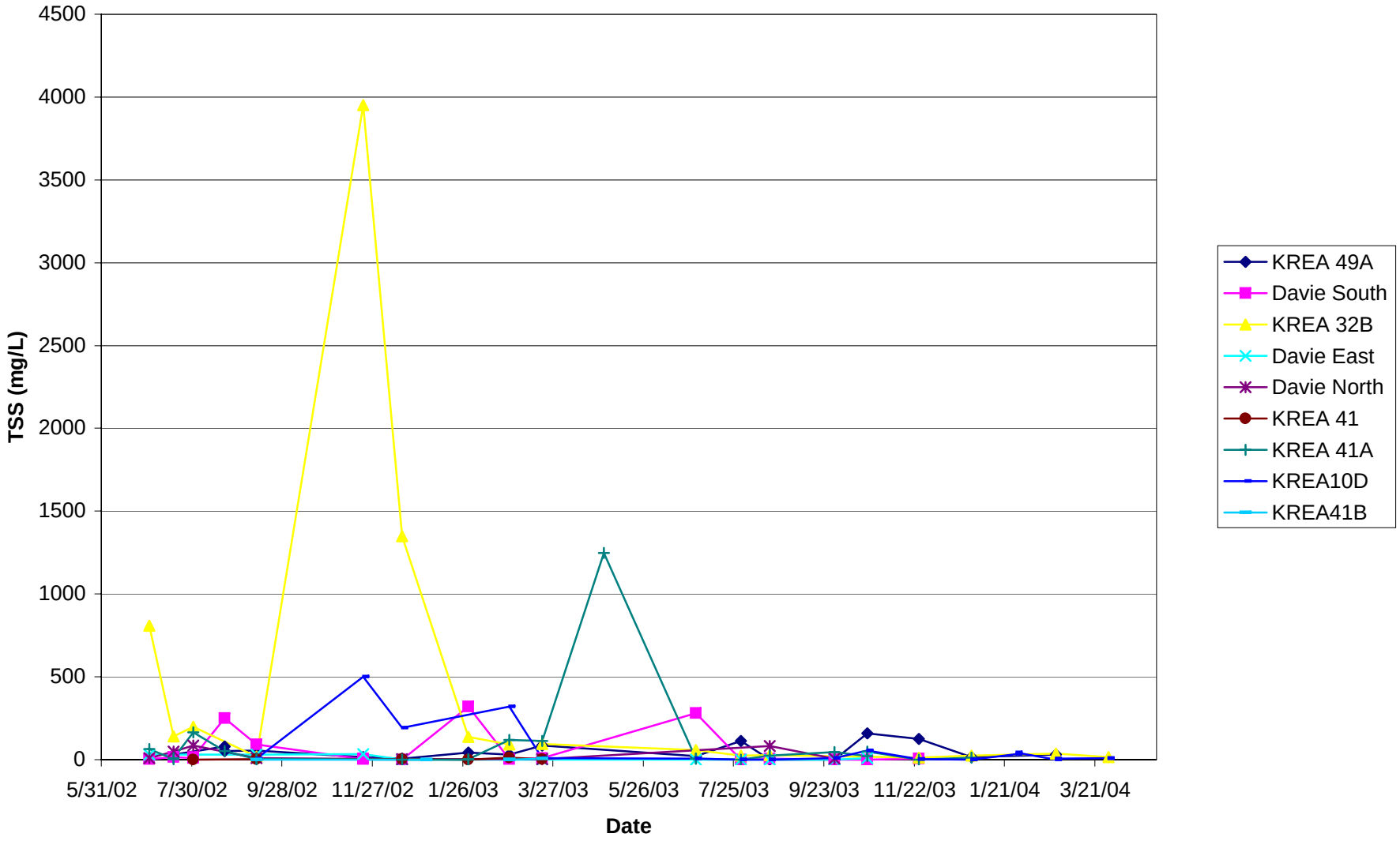


**Figure A-29. Total Suspended Solids Concentrations at Monitoring Sites**



# APPENDIX B

# UPDATED SITE MAPS WITH MONITORING LOCATIONS

**Figure 3.2. Map of Project Site (Butler Oaks Dairy.)**

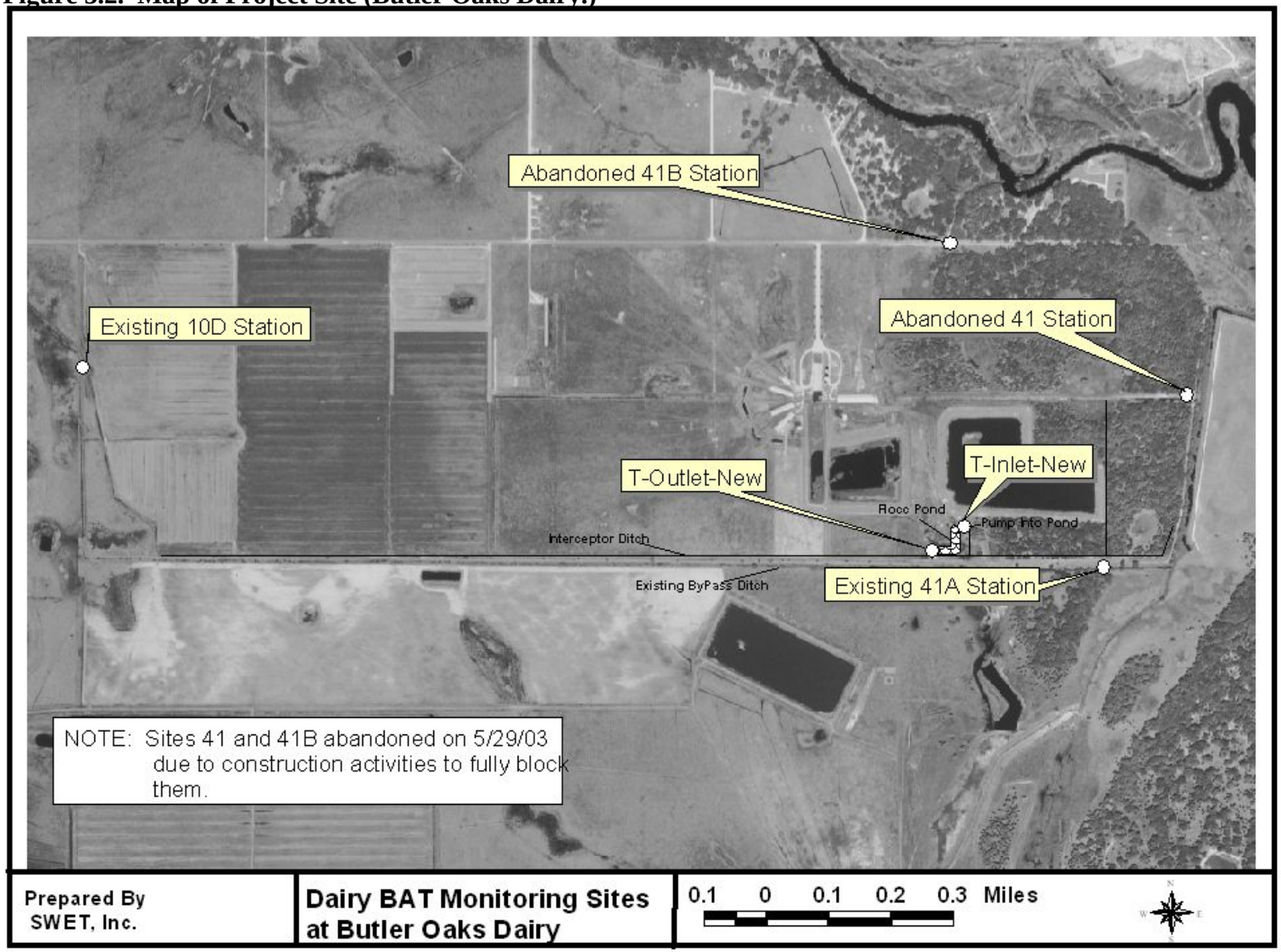


**Figure 3.2. Map of Project Site (Davie Dairy Inc.)**

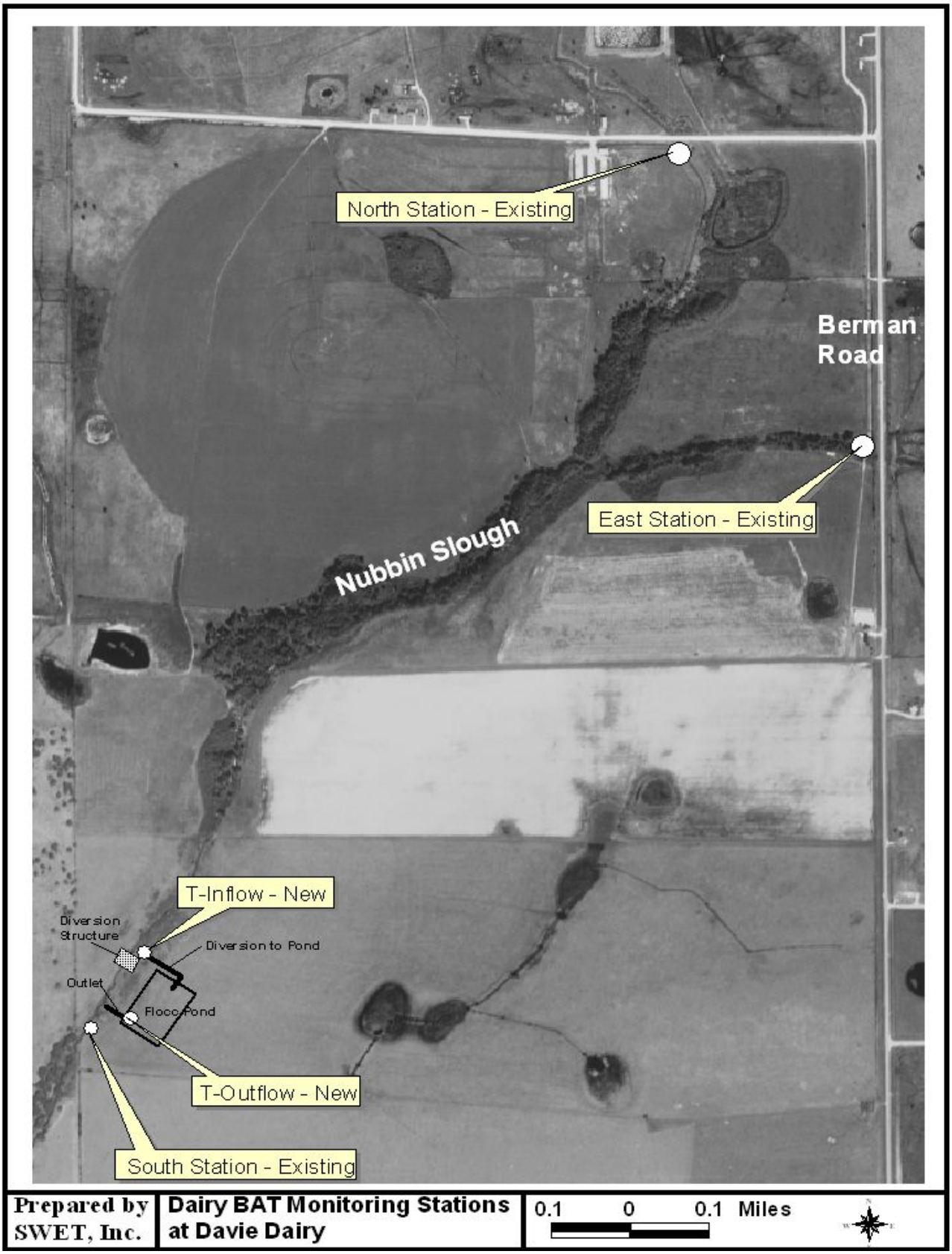


**Figure 3.2. Map of Project Site (Dry Lake Dairy.)**